THE OXFORD GEOGRAPHIES

JUNIOR GEOGRAPHY

BY

A. HEMMERTSON

AND

O. J. R. HOWARTH

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Geography.

Factors governing climate.
Latitude, Altitude Ocean
influence prevailing winds
Ocean currents. Contour of
the Land.

Latitude- is distance ~~east~~ north
or ~~west~~ south of the equator.

Altitude height above sea level.

Ocean Influence

Prevailing winds.

If winds are warm they
warm the climate - if
cold cool the climate - if
dry deprive the land
of rain

Oxford Geographies

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CONTENTS

PAGE

THE BRITISH ISLES

PHYSICAL, BIOLOGICAL, AND HUMAN GEOGRAPHY OF BRITAIN (Figs. 1–25) 5
IRELAND (Figs. 26–31) 29
ENGLAND AND WALES (Figs. 32–47) 41
SCOTLAND (Figs. 48–51) 76

EUROPE (Figs. 52–65) 92
NORWAY AND SWEDEN (Fig. 66) 119
DENMARK 122
THE FAEROE ISLANDS 123
ICELAND 123
THE NETHERLANDS 123
BELGIUM AND FRANCE (Figs. 67, 68) 125
BELGIUM 129
FRANCE (Fig. 69) 129
GERMANY (Figs. 70-79) 133
POLAND 146
THE ALPINE AND CARPATHIAN LANDS (Figs. 80, 81) . 146
SWITZERLAND 151
AUSTRIA (Fig. 82) 152
CHEKHO-SLOVAKIA 153
HUNGARY 154
RUMANIA 154
SPAIN AND PORTUGAL (Fig. 83) 155
ITALY (Fig. 84) 158
THE BALKAN LANDS (Figs. 85–88) 162
THE RUSSIAN LANDS (Fig. 89) 167

ASIA (Figs. 90–123) 174

AFRICA (Figs. 124–133) 211

AUSTRALASIA (Figs. 134–142) 233

AMERICA

NORTH AMERICA (Figs. 143–153) 245
BRITISH NORTH AMERICA (Fig. 154) 257
THE UNITED STATES (Fig. 155) 260
MEXICO (Fig. 156) 264
CENTRAL AMERICA 266
THE WEST INDIES 266
SOUTH AMERICA (Figs. 157–166) 267

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JUNIOR GEOGRAPHY

THE BRITISH ISLES

THE PHYSICAL FEATURES OF BRITAIN.

For map measurements see p. 91.

The map in fig. 1 shows the British Isles and the neighbouring parts of Europe. The largest island is Great Britain, which lies to the east of Ireland, the next largest. To the west is the Atlantic Ocean, which joins the icy Arctic Ocean in the north. To the east of Britain is the Old World. We shall see later that Britain is affected in many ways by the neighbourhood (i) of this vast ocean to the west, and (ii) of this immense land mass to the east.

The English Channel and the Strait of Dover separate Britain from the Continent. These are the 'Narrow Seas', leading from the Atlantic to the North Sea. The distance between Dover and Calais is 20 miles, and between Brittany and Land's End about 100 miles. From the Wash to Denmark is 400 miles, from Buchan Ness to Norway 300 miles, and from Shetland to Norway 200. Great Britain and Ireland are separated by the square Irish Sea, which is entered from the Atlantic by St. George's Channel and the North Channel.

Relief and Coast-line. Fig. 1 shows the high and low land of Britain, and the shallow and the deep seas. If the seas sank, or the land rose 600 feet, Britain would be joined to Europe, and the North Sea would become a plain, with the Goodwin Sands, the Dogger Bank, and other shallows rising above it as low hills. The part of the earth's crust covered by shallow seas is called the 'continental shelf,' and the islands on it are called 'continental islands'.

The lands between sea-level and 600 feet above it are called lowlands. The widest lowlands in Great Britain lie in the south

FIG. 1. The British Isles. The line round the blackened seas, marked –3,000, shows where the coast line would be if the sea sank or the land rose 3,000 feet. The line between the shaded seas and the white or shallow seas, marked –600, shows where the coast line would be if the sea sank or the land rose 600 feet. The line round the black land, marked 600, shows where the coast line would be if the sea rose or the land sank 600 feet. Such lines are called contour lines, and all the points they join are the same height above or below sea-level. (The former fig. 2 is omitted from this edition. A good physical atlas-map should be used in addition.)

and east, facing the plains of North France and the Low Countries. The fens and dunes of the Wash face the fens and dunes of Holland. The Thames estuary is opposite the Scheldt, and Southampton Water opposite the Seine. The narrowest crossing is from Dover to Calais, the sea is under 120 feet deep. The highlands of Great Britain lie in the north and west. Ireland has level plains in the centre, and highlands in the north and south.

Seas. The sea penetrates deeply into the land, and this has a marked influence on our climate. It also enables vessels to carry goods cheaply far inland. A set of circles drawn with a 50-mile radius, and their centres at the heads of the chief estuaries, show how few of our large towns lie far from the sea. It is only 25 miles between the heads of the Firth of Clyde and the Firth of Forth ; 80 miles between the Mersey and Humber estuaries, and 100 miles between the Thames and Severn estuaries. Shipping is helped by the strong tides that sweep in from the Atlantic (twenty-seven high tides a fortnight) and are piled up on the continental shelf. Vessels are carried up the estuaries by the rising tide and brought down again by the falling tide. Both in the Irish and North Seas the tidal waves enter from the north as well as from the south, and at some places both tides combine : e.g. Dublin and London, which have exceptionally high tides.

Highlands and Uplands. These are :

I. The Scottish Highlands.

II. The Central Highlands, consisting of—

- i. The Southern Uplands.
- ii. The Cumbrian Highlands.
- iii. The Pennines.

III. The Southern Highlands.

- i. Welsh Highlands.
- ii. The Heights of Devon, Cornwall, or South-western Peninsula.

IV. The Scarp Lands of S.E. England, which are belts of much lower heights.

FIG. 3. The Rocks of Britain. The surface rock greatly affects the life of a region, through (i) the kind and quantity of soil, (ii) the abundance and scarcity of water, (iii) the character of the occupations, and (iv) the position of towns and villages. The table in this map arranges the rocks in order of their age: (i) primary, (ii) secondary, (iii) tertiary, and (iv) recent or quaternary.

The broad Central Lowland or Midland Valley of Scotland separates the Northern and Central Highlands, and a number of smaller lowlands are found round the margin of both of these highlands. The most extensive lowlands are in the Midlands of England, between the Scarp Lands and the Central and Southern Highlands. These send an important arm between the Pennines and the Welsh Highlands to the Irish Sea (Plains of Cheshire and Lancashire) and east of the Pennines form the Vale of York.

Notice that the general direction of the highlands and lowlands of Great Britain is from south-west to north-east, except in the Pennine region, where it is north and south, and in the south of Wales and of England, where it is east and west.

South and east of a line from the Tees to the Exe are plains out of which rise long ridges, mostly under 1,000 feet high. Across these plains or vales the longest rivers of England flow. The ridges all rise steeply on one side, forming what is called an escarpment or scarp, and slope much more gradually on the other side. Such ridges are called scarped ridges, and the south-eastern part of England a scarp land. (See figs. 40, 45, 47.)

In the south of Ireland the general direction of ridge and valley is east and west, but elsewhere it is from south-west to north-east, as in Great Britain. The highlands are round the margin, and may be arranged in two groups (1) the Northern and (2) the Southern Highlands, separated by (3) a very broad Central Plain. This plain reaches the sea in the east opposite the Lancashire and Cheshire Plain of England.

The Structure of Britain. Compare the maps of figs. 1 and 3, after colouring red all of the rocks older than, i.e. below, the Permian. The highest lands rise where the older rocks, which are harder than the younger rocks, appear at the surface. In the scarp lands, which consist of younger rocks, the rocks are tilted and there are alternate layers of harder rocks, which form the scarped ridges, and of softer rocks, which form the flat clay vales between them.

Notice next that the Central Lowlands of Scotland and of Ireland are mainly of carboniferous rocks, which in Northern England have been raised to form the Pennines. This shows that it is important to know how the different layers or beds of rock are arranged. In some places they lie horizontally, in others they are tilted, as in the scarp lands, and in others they have been thrown into folds, as in south-west Ireland, forming a set of arches or upfolds, and troughs or downfolds. In the course of ages the tops of the arches may be so worn away by weather, running water, and moving ice, that it is not possible to trace the upfolds and downfolds as ridges and valleys. This is the case in the Welsh and Scottish Highlands. In the course of these changes the older rocks, which once were far below the surface, are brought to light. As some of these contain valuable minerals this may bring prosperity to a whole district. This has happened in the Pennine coal-fields. (See p. 45.)

In other parts of Britain the layers or strata have split and cracked. Sometimes hot molten rock has pushed its way upwards and formed volcanoes, the remains of which can be seen in the Scottish Lowlands, or vast lava flows, as in the north-east of Ireland (Antrim plateau, see p. 31). This fracturing or faulting may cause whole blocks of rock to sink, leaving other blocks standing up above the sunken mass. When the mass which has sunk is between two parallel sets of faults it forms a long depression or rift valley. Such is Glen More, which cuts the Scottish Highlands into two, and such is the Central Lowland of Scotland.

The surface of Britain, except in the south of England, has been altered by the ice which formerly covered it. The steep-sided valleys, with long narrow lakes, and the fiord coasts of the Highlands are the result of this. Boulder clay, which was formed of the waste of the different rocks over which the ice passed, covers much of the lower heights and plains, and in some cases makes a district fertile which would not otherwise be so (e.g. the chalk in Norfolk).

Rivers. In studying the highlands and uplands of Britain in a physical map it is seen that the head-streams flow straight down the highland slopes, but on entering the lowlands some turn sharply at right angles, and flow parallel to the base of the

FIG. 4. The chief Rivers, River Basins, and Divides. The main divides between rivers flowing N., S., E., or W. are shown by dashes, the minor divides by dots.

highlands until they reach the sea, e.g. Dee, Trent, Yorkshire Ouse. In the west, where the highlands fall steeply to the sea, the rivers are short, swift, and unnavigable, and flow in narrow, steep-sided valleys. These mountain valleys are often very beautiful, but not, as a rule, profitable to man, though the force of the stream is sometimes used as a source of power

to drive mills or generate electricity. The long lowland streams are sluggish, and form navigable waterways in their lower courses. They become less swift as they near the sea, and begin to drop their sediment and build up fertile plains of river soils (alluvium). Much of the richest farm-land lies in these wide valleys.

Compare the basins of the largest rivers, noting how far they lie in the highlands, and how far in the lowland. Trace the main water-parting or divide between the basins of the streams flowing east and the basins of the streams flowing west (fig. 4) and compare it with a map of physical features.

Plant and Animal Life and Products.

Vegetation. Britain lies in a belt of cold temperate forests, i.e. pine forests in the north, summer-green forests of oak, elm, &c., in the south. Formerly most of the country was covered with forests, which have been cut down for fuel or timber, to form clearings for cultivation, and to make communication easier. Their place is taken by cities, towns, and agricultural land, except where such woods as Sherwood, Epping Forest, and the New Forest have been preserved. Trees will not grow above a certain height of land, and on the higher ground heather moors (the grouse moors and deer forests of Scotland) are common. In the flatter parts of the highlands, especially in Ireland, shallows of stagnant water accumulate, in which only peat-moss and marsh plants grow. Such peat bogs or reedy fen lands, and the salt marshes and sand dunes that fringe our coasts, are the chief lowland wastes. Each has its own peculiar plants.

The kind of woodland is often determined by soil. Oaks and elms do best on stiff clays. Light porous soils do not suit trees, but beeches (the commonest tree in chalk lands) and pines, and an undergrowth of birch and bracken, which have deep far-reaching roots, can live where other trees fail. Firs and pines are planted on the chalk downs, the sandy moorlands, and the shifting sand dunes along the coast.

Animals. The wild animals of Great Britain resemble those of the mainland of Europe, but there are fewer kinds. No large mammals are peculiar to the British Isles. Some of those found in Great Britain are absent in Ireland, e.g. the mole, weasel, and all kinds of snakes. Many disappeared with the ancient forests and fen lands. The bears, wolves, and beavers of Roman times are now extinct. A few are preserved by sportsmen, who pay high prices for deer forests, grouse moors, and salmon rivers.

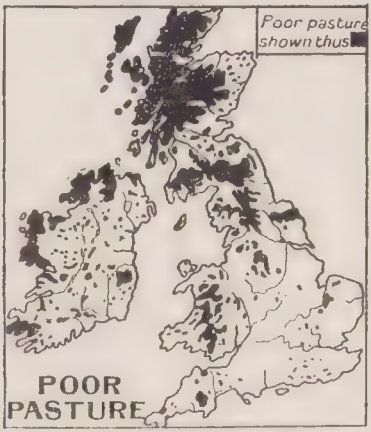


FIG. 5. Poor Pastures in the British Isles, chiefly hill pastures.

FIG. 6. Distribution of Sheep in the British Isles.

Plants and Animal Products of Britain. Fig. 5 shows the poor pastures, moors, and waste lands in black. These are sheep lands. It is easy to get materials for a map showing the distribution of sheep in Great Britain and Ireland. Every year a farmer must fill up forms stating how many sheep and cattle he has, how much land he has sown with wheat, barley, oats, &c., and how much in grass. These forms are sent to the Boards of Agriculture in London or Dublin, and from them reports are compiled which give the number of sheep, cattle, &c., and the number of acres under

FIG. 7. Distribution of rich Pasture in the British Isles.

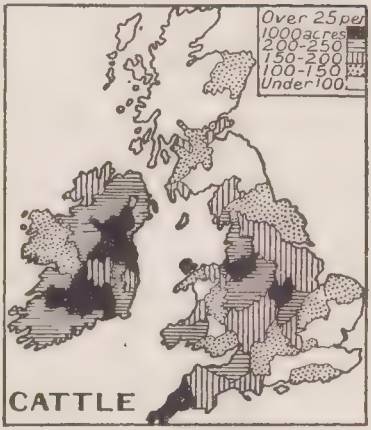


FIG. 8. Distribution of Cattle.

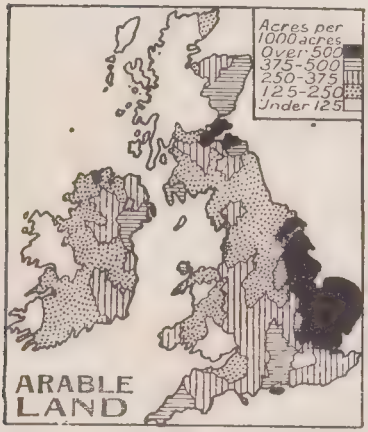


FIG. 9. Distribution of cultivated land.

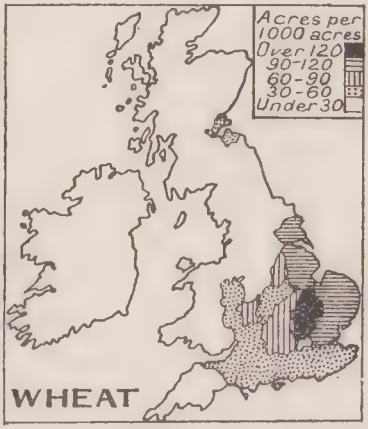


FIG. 10. Distribution of wheat in Britain, showing the number of acres out of every thousand in which wheat is grown.

grass, or crops for each county. In a large county there are usually more cattle, sheep, &c., than in a small one. Lancashire has about 335,000 sheep, but Oxfordshire only about 232,000. In spite of this, sheep rearing is more important in Oxfordshire than in Lancashire. To compare the figures, we must consider, not only the total number of sheep in each county, but also the total number on a given area. Take 1,000 acres (a little over $1\frac{1}{2}$ square miles) as the unit. Oxfordshire, with over 480,000 acres, has 483 sheep per 1,000 acres; Lancashire, with nearly 1,200,000 acres, has only 280 sheep per 1,000 acres. Sheep rearing, therefore, is nearly twice as important in Oxfordshire as in Lancashire. Fig. 6 shows the number of sheep per 1,000 acres in each county. Fig. 8 shows the distribution of cattle.

It is part of the business of geography to explain these facts. Why are sheep more important than cattle in parts of Great Britain, and why are cattle more important than sheep in Ireland? The answer must be sought in the relief maps, vegetation maps, climate maps. The relief map, for example, suggests one possible explanation. Cattle are more important on the lowlands (Cheshire or Pembroke), and sheep in hill districts (e. g. Central Wales), but this is not all.

Fig. 9 shows the number of acres of land in crops per 1,000 acres, and fig. 7 the number of acres in pasture per 1,000 acres in each county. On the arable lands are grown cereals (food grains), mainly wheat, barley, and oats; root crops, such as potatoes and turnips, beans, peas, and grass for hay and fodder. These crops are not grown haphazard all over the arable land. Wheat, for example (fig. 10) is chiefly grown between the Humber and the Thames. Elsewhere, oats are the chief cereal. Barley is grown everywhere, but most is raised in the wheat counties.

Some parts of the country produce distinctive crops, such as hops (Medway and Lower Severn valleys), flax (Ulster), cider apples (Kent, Devon, Hereford, and Worcester). Potatoes are important in Ireland, and market-gardens near towns.

Comparing the sheep, cattle, arable, and pasture maps, we find that the eastern lowlands are arable, that sheep are commoner on the eastern hills, and cattle on the western

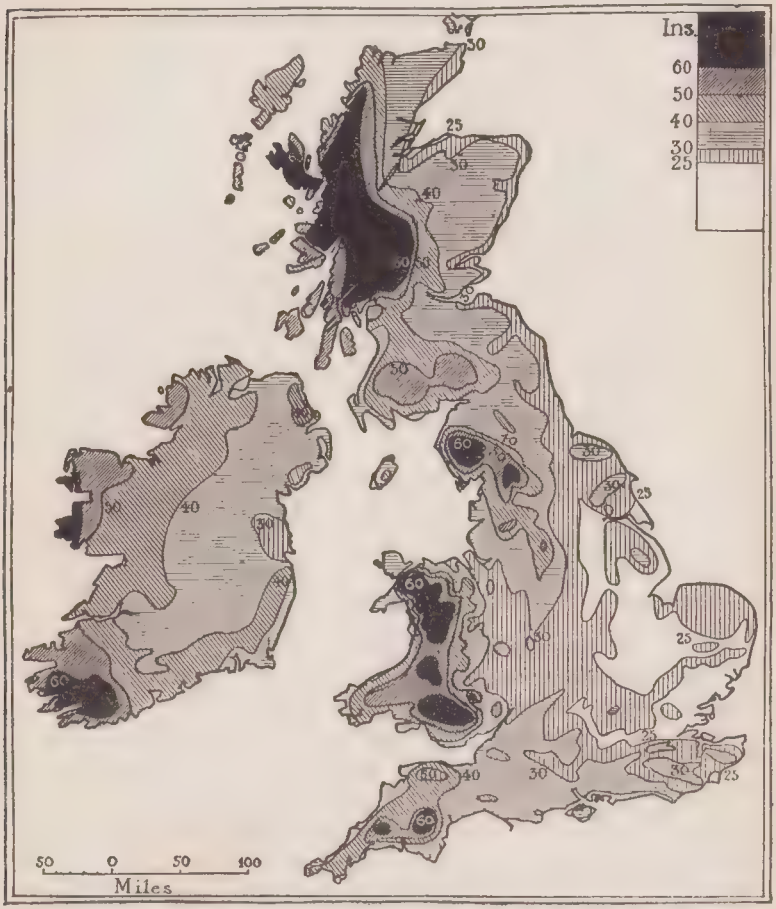


FIG. 11. Mean Annual Rainfall of Britain. The map is compiled from observations taken all over the country. The darkest parts are the wettest and also the highest. The white parts are low and have less rainfall.

lowlands. But highland and lowland, and even soil will not account for all the differences, and we must seek other clues in the air above and the soil beneath.

Climate.

Climate of Britain. Rainfall. The atmosphere contains a small proportion of water, which rises as invisible vapour, gathers into visible cloud or mist, and falls as liquid rain, or solid hail or snow. This rain or snow is caught in rain-gauges at various places, and the amount is measured and recorded at fixed intervals. From these records maps are made for each month, and for the year. Some years are wet, others are dry. To discover average or mean rainfall which may be expected in the year, the totals for several years are added together, and the sum is divided by the number of years. At the observatory in Camden Square, London, the rainfall during five years was as follows:—

	inches.
1900	23·3
1901	22·2
1902	20·8
1903	38·1
1904	20·7
Total for five years,	125·1
Average for 1 year,	25·0

When the average rainfall for a number of places has been found, the figures are entered on a map. Lines are then drawn through places with the same rainfall. Such lines are called *isohyets*. In this way the country is divided into rainfall districts. Places with a mean annual rainfall of over 40 inches have a heavy rainfall, and under 40 inches a light rainfall.

Fig. 11 shows the mean annual rainfall of the British Isles. It shows that the areas of lowest rainfalls (under 30 inches a year) lie in the eastern lowlands, and that the areas of heaviest rainfall are the Highlands of West Scotland, the Lake District, Wales, and two patches in Western Ireland.

Compare this map with the maps for sheep, cattle, arable and wheat land. They resemble each other in many ways.

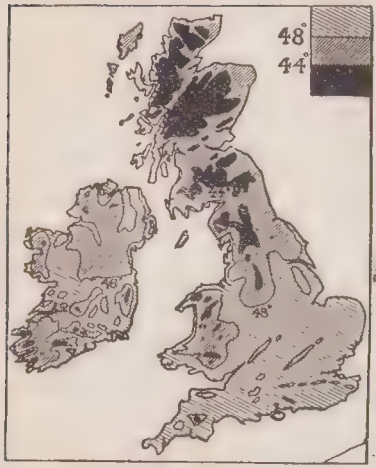


FIG. 12. Actual Mean Annual Temperature, unreduced. The darkest parts are the highest and coldest.

FIG. 13. Mean Annual Temperature of the British Isles, reduced to sea-level.

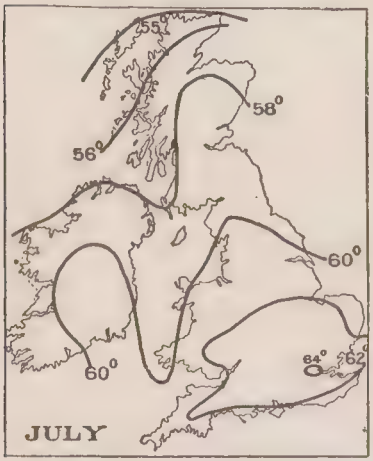


FIG. 14. Mean Temperature of the British Isles in July, reduced to sea-level.

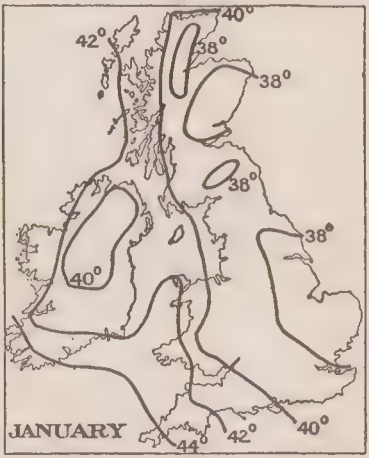


FIG. 15. Mean Temperature of the British Isles in January, reduced to sea-level.

The eastern arable land is relatively dry, but the western pasture land is wet. Sheep are found in the drier parts, cattle in the moister parts outside the mountain area, and wheat only in the very driest parts of the east. Wheat is cultivated in the southern counties mainly, and little is raised on the equally dry plains of eastern Scotland. Why? The answer is given in the temperature maps (figs. 12–15).

Temperature. Weather stations have two thermometers, shaded from the sun, and protected from the wind. One registers the highest, or maximum temperature, and the other the lowest, or minimum temperature for each day. By adding together the mean temperatures of every day for a month, and dividing by the number of days in the month, we get the mean monthly temperature. The mean annual temperature is the sum of the mean monthly temperatures divided by 12, for the number of months. The mean annual temperature of each weather station is entered on a map, and lines are drawn through places with the same temperatures. Such lines are called isotherms.

Fig. 12 shows the mean annual temperatures of the layers of atmosphere immediately in contact with the land. To make the map clearer, the land between the isotherms has been shaded. The darker shading shows where the air near the surface is colder, the lighter shading where it is warmer. A comparison with fig. 1 shows that the colder areas are highlands. If we climb a high hill, we soon discover that the air grows colder as we ascend. In winter the hill-tops are white with snow, long after it has disappeared from the valleys and plains below. We have seen that trees will not grow above a certain height, another proof of the greater cold at that height. Observations show that it becomes 1° F. colder for every 300 feet of height. On the top of Ben Nevis it is about 15° colder than at Fort William, 4,400 feet below.

Let us now compare the air temperatures of places at the same height above sea-level. The lowlands of the north are colder than those of the south. Why? Because the Sun

does not rise so high in the north as it does in the south. If we plant a stick upright in level ground, the angle made by the surface of the ground and a line joining the top of the stick to the end of its shadow, gives the height of the Sun. At the Lizard, the Sun is always 10° higher above the horizon at noon than in the Shetland Isles. The higher the Sun, the greater is its power of warming the Earth's surface.

In most temperature maps the temperatures show not the exact temperature of a place, but what it would be at sea-level. This is found by adding 1° F. for every 300 feet above sea-level. The isotherms thus drawn do not show the influence of the height of the land.

Fig. 14 shows the mean July temperatures. As we should expect, the greater height of the Sun in the south makes the southern days warmer. Compare the maps for July and January (figs. 14, 15), and notice that

(1) the July isotherms on the whole, run west-east, the January isotherms north-south.

(2) in July, London (64° F.) is warmer than the Orkneys (55° F.), but in January, London (39° F.) is *colder* than the Shetlands (40° F.).

This last fact is very remarkable. It does not depend either on the Sun, which is as much higher at noon in the south as in other months, nor on the length of day, for January days are shorter in the Orkneys than in London. The reasons are these. The greatest area and depth of water lies west of the British Isles, the largest land surface lies east. Land heats quickly, and cools quickly. Water heats slowly, and cools slowly. On a hot summer's day, a bare rock will burn your hand, and you bathe it in the cool water beside it. On a clear summer's night the same rock is stone cold, but the water feels warm. In fact it is slowly cooling, and giving out the heat it has absorbed during the day. Again, a cupful of tea cools more slowly than a saucerful. If you apply these familiar facts, you can easily explain the July and January isotherms.

In July the hottest area lies over south-eastern England.[1] The coolest lands are those washed by the north-western seas. There the deep Atlantic is still slowly absorbing heat.[2] The North Channel and Irish Sea carry this cooling oceanic influence south, and so the isotherms of 58° F. and 68° F. curve south. In the east the shallow North Sea is soon warmed, and has little influence (see the slight southward bend of the eastern ends of the isotherms) in cooling the land. The English Channel cools the south coast slightly. Tourists leave the heat of London for the refreshing sea breezes of Ramsgate or Brighton.

In January these conditions are reversed. The land has long lost its summer heat, and is chilled. It is coldest in the east where it faces the ice-bound plains of Central Europe. On the other hand, the sea has still some store of summer heat. Hence the warmer areas face the deep waters of the Atlantic coast. The straits and channels bear this influence inland. The curves of the isotherm of 42° F. show this, slightly in the north, but more clearly in the south. We shall see why when we consider winds. By January the shallow North Sea has cooled entirely.

The differences of the January and July isotherms, then, are mainly due to differences in the distribution of land and sea and in the length of night and day. The temperature maps for April and October, when days and nights are nearly equal, are very similar to that for the year.

Winds. Winds are named from the direction from which the wind comes and to which the arrow of the wind vane points.

[1] The days are longer in the north, but this is not enough to counterbalance the effect of the Sun rising higher in the southern heavens, and shining more directly down on the Earth.

[2] The surface-layers of the land are warmest in July, not long after the Sun has reached its highest summer position in the heavens, but it is not till August that the surface-waters of the sea reach their highest temperature. The reverse happens in winter, and the surface-layers of the land are coldest in January, the month which follows the shortest day, while those of the sea are not at their coldest until a month later, in February.

If this direction is noticed, it will be found that on two days out of three, our winds come from the west or south-west, i. e. from the Atlantic.

The arrows on the map in fig. 16 show the direction of the prevailing winds for January. These bring air which has been in contact with the Atlantic water. They therefore bring warmth, especially the south-westerlies (see the curve of isotherm 42° F. in fig. 15), but become chilled as they

16 17

FIGS. 16 and 17. Winds of the Atlantic: (16) in Winter, (17) in Summer.

pass over the land, and are colder on the east than on the west coast. The east winds, which come from colder lands and colder seas, are dry and biting. In spring and autumn the south-west winds are not nearly so strong, and in spring they are not so frequent, while the easterly winds are not so cold. In summer (fig. 17) the south-west winds are still weaker, and though the sea is cooler than the land in the same latitudes, these winds come from warmer latitudes, and cool the land less than they heat it in winter.

Climate, Livestock, and Crops. We are now better able to explain the distribution of pastoral and agricultural land, sheep, cattle, and wheat. Cattle are commonest on the lowlands of the north and west, because the wetter and milder climate (i.e. a longer season of growth) favours tall juicy dairy grasses. Sheep, which do best on the short wiry grass of well-drained soils, are commonest on the drier eastern slopes of the highlands, and the porous limestone and chalk hills of south-eastern England. Cereals are grown in the east and south-east, and wheat assumes importance only in the drier districts of the east, which have the warmest summers. Scotland was in olden times the 'land of (oat) cakes' and porridge, for oats resist the cool moist autumns better than any other cereal.

This study of climate shows that the distribution of products, plant or animal, is not accidental. Farmers have learnt by long experience what parts of the British Isles suit various kinds of live stock and field crops. Their talk of the weather is the talk of practical men. This relation between products and climate, applies, as we shall see later, to other countries as well. We may go further. Relief, climate, soil, control not only plants, and through them animals, but man himself, and even the ideas of man.

Human Geography.

Political Divisions. The British Isles include (1) the Kingdom of England, with its capital London, the capital also of the British Empire; (2) the Kingdom of Scotland, capital, Edinburgh; (3) the principality of Wales. These are under the imperial parliament. Ireland is divided between (4) Ulster in the north-east (capital, Belfast) with its own parliament, but sending members also to the imperial parliament; (5) the Irish Free State, occupying the rest of Ireland, capital, Dublin. Great Britain and Ireland are subdivided into counties, boroughs (the larger or older cities and towns), urban districts (smaller, or sometimes large but modern, towns), and rural or country districts. The Isle of Man in

the Irish Sea, and the Channel Islands in the English Channel, have their own parliaments.

Language and Religion. Over 47 million people live in Britain, and 36 million of these live in England. Scotland has $4\frac{3}{4}$ million people; Ireland more than $4\frac{1}{4}$ million; and

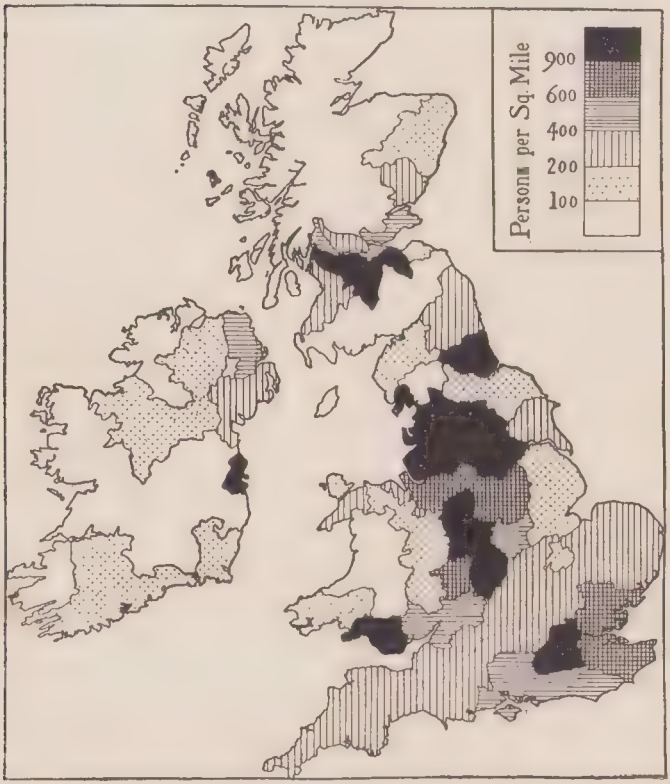


FIG. 18. Density of Population in each County. Cf. Fig. 36.

Wales $2\frac{1}{4}$ million. Nearly all speak English; but some speak Celtic as well. Celtic languages are spoken in the Scottish and Welsh Highlands, Ireland, and the Isle of Man. French and English are both spoken in the Channel Islands. Most of the people of Great Britain are Protestants, but Roman Catholics outnumber Protestants in Ireland.

Distribution of Population. Every ten years a Census of the people of Britain is taken, and gives, not only their numbers, but also their means of livelihood. Fig. 18 shows the density and figs. 19 and 20 the chief occupations. Here again, for comparison, the numbers have been mapped per 1,000 acres. Fig. 19 gives some idea of how people would be distributed if there were no manufactures or commerce in Great Britain, and shows roughly which districts were most

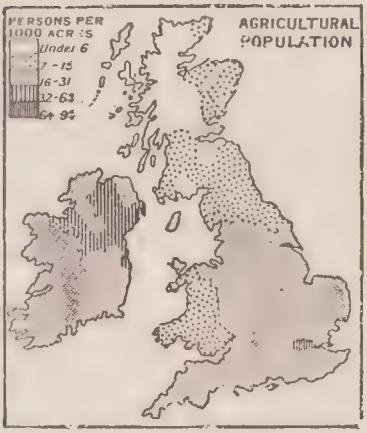


FIG. 19. Distribution of Agricultural, Pastoral, and Fishing Population in the British Isles.

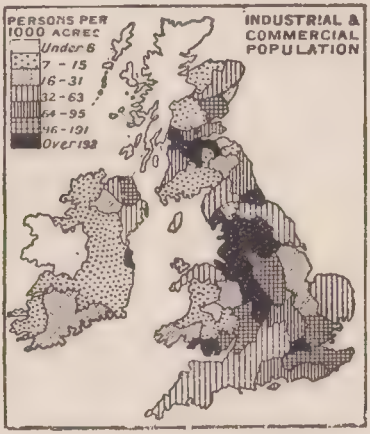


FIG. 20. Distribution of Industrial and Commercial Population in the British Isles.

thickly peopled before the rise of manufactures. The flat lowlands of south-east England and Ireland have a more dense agricultural population than the highlands of Wales and Scotland.

Population on the Coal-fields. Fig. 20 shows that the industrial population is crowded round a few centres. Neither relief nor climate explains the position of these centres, but fig. 21 does. The densest population, except in the London area, is on or not far from the coal-fields. Coal is used to

make steam-power for driving machinery, and it pays best to build factories near the coal mines.

In Britain, the chief coal-fields occur in three belts:—

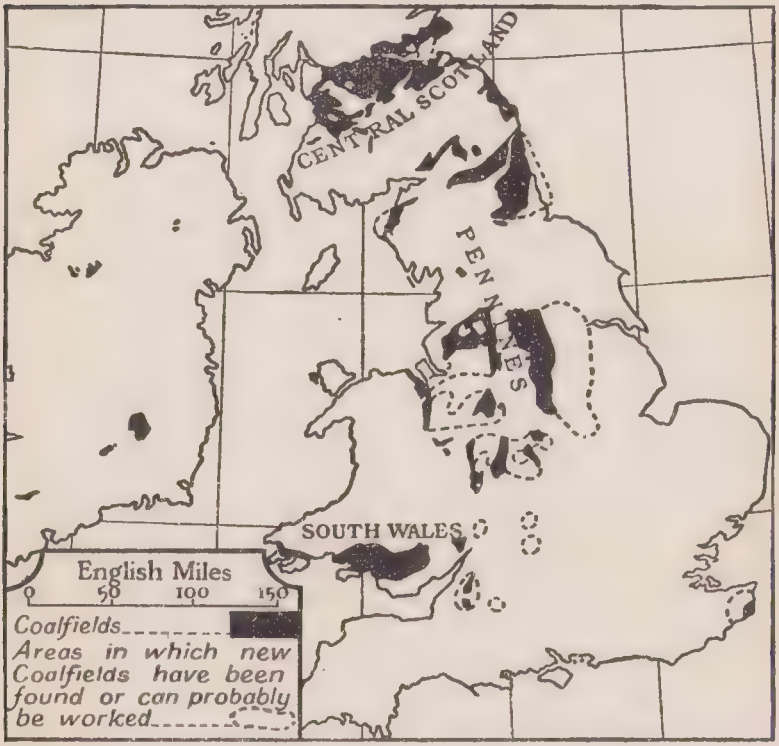


FIG. 21. Distribution of Coal in Britain.

The broken lines enclose areas in which coal exists at some depth, but probably not too deep for profitable working. Compare this with the next four figures.

1. In central Scotland.

2. On the flanks of the Pennines, and south of the Pennines in the midlands of England.

3. On the east and south margins of the Welsh Highlands.

Only two great industrial centres lie far from the coal-fields. Belfast imports cheap coal from Scotland, and London imports its coal from north-east England by sea and land.

FIG. 22. Distribution of Cotton and Linen Manufactures.

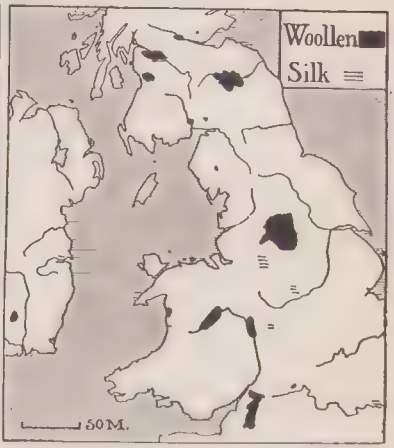


FIG. 23. Distribution of Woollen and Silk Manufactures.

FIG. 24. Distribution of Iron ore, Iron-works, and Ship-building.

FIG. 25. Towns with over 50,000 Inhabitants.

FIG. 26. Physical Features and Towns of Ireland.

IRELAND.

Ireland. Ireland lies west of Great Britain near the edge of the continental shelf. It is 13 miles from the nearest point of Scotland, and 140 miles from England where the Irish Sea is widest. Dublin is a little more than 6° west of Greenwich and as time is reckoned by longitude (four minutes fast or slow for each degree east or west of Greenwich) Irish time used to be nearly half an hour later than English time as Dublin time was used all over Ireland, but now Greenwich time is used.

The west coast of Ireland faces the New World, the nearest point of which (Labrador) is only 1,700 miles away, but there is no great trade between them, for the Atlantic coast is high and barren, and has neither good harbours nor much produce to export.

General Physical Features. The physical map in fig. 26 shows that the centre of Ireland is a lowland with hardly a height over 600 feet. North and south are upland areas broken into many small mountain groups by wide river valleys. Lines drawn from Dundalk to Sligo and from Dublin to Limerick roughly bound the Central Plain and divide Ireland into three natural regions, (1) Northern Ireland, (2) Central Ireland, and (3) Southern Ireland.

Northern Ireland.

The Donegal Highlands. There are three mountain groups, the Donegal Highlands, the Sperrin Mountains, and the Antrim Highlands. East and west of the Sperrin Mountains the Foyle and Bann have cut deep valleys to the Central Lowlands. The Donegal Highlands are among the wildest in Ireland, with long south-west to north-easterly valleys. The coast is rugged, forming great cliffs, and is cut by inlets, of which Lough Swilly is the largest. Bare boulder-strewn

uplands support a few sheep, from the wool of which the peasants make 'Donegal tweeds' or homespun. This is a very poor district, and owing to the steep cliffs, the inhabitants are unable to eke out their resources by fishing. Agriculture is very difficult (and only in the valleys and on lower slopes can a little fertile land be found). The result has been that the population, though small, has outgrown the food supply, and emigration, chiefly to America but also to Great Britain, has become necessary.

Two fertile lowlands lie at the base of the Donegal Highlands. One of these opens west to the Atlantic and forms the valley of the river Erne. This river widens out for half its course into lakes, of which Upper and Lower Lough Erne are the chief. Enniskillen is built at the head of Lower Lough Erne, and Ballyshannon at the mouth of the river, where it flows into Donegal Bay.

The second lowland opens north to Lough Foyle, which is its submerged lower end, between the Donegal Highlands and the Sperrin Mountains. Omagh, Lifford, and Strabane are the largest inland towns. Londonderry, at the head of Lough Foyle, bleaches linen and makes shirts. Moville, at the mouth of the lough, is a port of call for Atlantic steamers. A railway runs through the lowland gap between the Sperrin and Donegal Mountains, by Strabane and Omagh, to Dundalk and Dublin.

The Antrim and Mourne Mountains. East of the Foyle a circle of highlands surrounds the flat basin of Lough Neagh, the largest lake in the British Isles. From this basin four strips of lowland radiate outwards, dividing the adjacent highlands into four groups. In the north the wide valley of the Bann, with Coleraine at its mouth, separates the Sperrin Mountains to the west from the Antrim Mountains to the east. The south-western gap of the Blackwater separates the Sperrin Mountains from the ancient, worn-down highlands of Armagh. A southward gap runs from Newry to the valley of the Upper Bann, between the

Armagh Heights and the Mourne Mountains. The last and most important gap is that of the Lagan, which flows out at Belfast, and separates the Mourne Mountains from the high volcanic plateaus of Antrim. The steep cliffs of Antrim are very beautiful. They show horizontal bands of black basaltic lava overlying and preserving bands of white chalk. The Giants' Causeway is a beautiful example of the way in which basaltic lava sometimes cools into regular columns. Lough Neagh is a 'rift lake', formed by the sinking down of a mass of basalt, and is very shallow for its size. The Mourne Mountains are also volcanic, and formerly contained valuable deposits of gold and copper ores. Most of the lowland between the Mourne Mountains and the sea is occupied by the fiord of Strangford Lough. 'Ford,' in such names as Strangford, Wexford, Waterford, is the same word as the Norwegian word *fiord*, and the Scottish word *firth*. It was given to these inlets by Danish pirates.

Routes. All the gaps are used for railways and canals. The canals centre in Lough Neagh. The south-western or Blackwater gap is used by the Ulster Canal, which goes by Monaghan and connects with the Erne and Shannon waterways. The Newry Gap is used by the railway which runs from Dublin, through Newry to Portadown, and then turns east by the Lagan valley to Belfast. The shortest sea-route between Ireland and Great Britain is from Larne to Stranraer (41 miles). A still shorter crossing from Donaghadee to Port Patrick (21 miles, cf. Dover to Calais) is not used for regular traffic, as heavy seas prevent the building of permanent harbour works at Port Patrick. (For canals, see fig. 27 ; for railways, fig. 26.)

The North-Eastern Industrial Area. The north-eastern corner is the only industrial part of Ireland. It owes its prosperity in great part to its convenient position opposite the coal-fields of Scotland and Northern England. Belfast is by far the most important industrial and commercial centre in Ireland. Situated on a navigable estuary, it is in direct

communication with Glasgow, Barrow, and Liverpool. Hence, with supplies of cheap coal and iron, it is, like the Clyde, a great shipbuilding centre, and makes heavy machinery. There are also great distilleries and tobacco factories. Most important of all is the linen industry. For this, Belfast has the advantages of extremely pure water for steeping and bleaching flax, and a moist climate. Some of the flax is grown locally, but much is imported from Belgium and the Baltic lands. Linen (with the attendant industries of rope and sailcloth) is also manufactured in the adjoining towns, Lisburn, Lurgan, Armagh (the seat of an archbishopric of the Episcopal Church of Ireland), and Newry. Shirt-making is also widely carried on. This area was colonized from Scotland by Cromwell. There are many differences between this Protestant industrial community and the rest of Ireland, which is mainly pastoral and Roman Catholic.

Very few mineral deposits are worked. Dungannon is the centre of a small and as yet unimportant coal-field. Aluminium and iron are worked at Glenarm and Ballymena, but no smelting is done in Ireland, the ores being sent to Foyers near Inverness and the Scottish coal-fields. Tourists have developed small coastal towns such as Coleraine (for Portrush and the Giant's Causeway), and Newcastle at the foot of the beautiful granite masses of the Mourne Mountains.

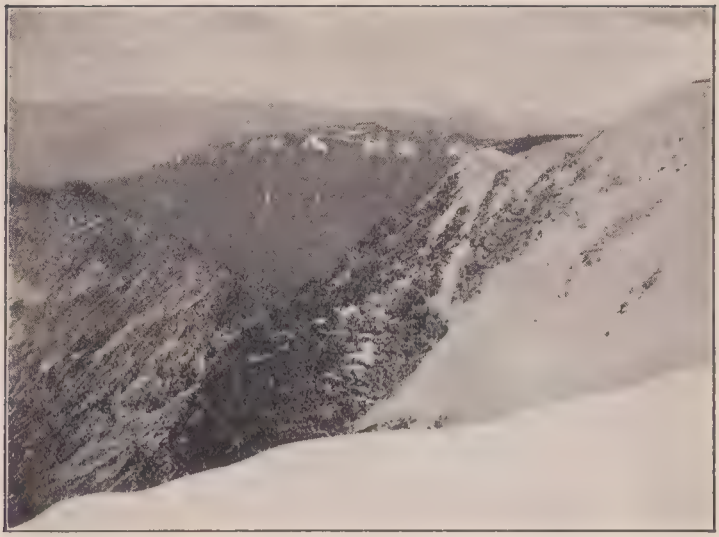
The Central Lowland.

On the west coast the Central Lowland reaches the sea at Sligo on Sligo Bay, Westport on Clew Bay, Galway on Galway Bay, and Limerick on the Shannon Estuary. These are the most important coast towns in the western part of the lowland. It reaches the sea in the east between the Mourne and Wicklow Mountains. Dundalk, Drogheda, and Dublin are the most important coast towns in the east.

Dublin is in a natural situation to make it a centre of main routes both by land and sea. Trace the railways which spread out from Dublin across the plains: (1) to Belfast

I. Mountain and bog in Ireland

II. Nant Gwynant, under Snowdon, N. Wales



III. The Lake District in spring: Helvellyn

IV. The Pennines: watershed of Teesdale and Weardale

via Drogheda, Dundalk, and Newry (all bridge towns like Dublin); (2) to Sligo via Mullingar, Longford, and Carrick-on-Shannon; (3) to Galway via Mullingar, Athlone, and Ballinasloe; (4) to Wexford via Wicklow; and (5) the more devious route to Cork. Two canals also cross this flat land. The Royal Canal follows the railway to Mullingar and turns west to join the Shannon above Lough Ree. The Grand Canal runs due west through Tullamore, and afterwards follows the Brosna tributary of the Shannon.

The oversea communications of Dublin are still more important. Apart from Belfast, it has the best of the east coast harbours, and lies opposite Lancashire and the western ends of the routes which lead to industrial England and London. For the fastest services, Kingstown (formerly, and now, called Dunleary by the Irish) at the south-east end of Dublin Bay, is used by mail steamers for Holyhead, off the Welsh island of Anglesey. Owing to its easy communication with the main routes of England across the Cheshire Plain, Dublin was the centre of English rule in Ireland before the Free State and Ulster were set up as separate States. As an industrial centre it is noted for Dublin porter (made with water brought from the Wicklow mountains), for whisky, and, together with the neighbouring town of Balbriggan, for the manufacture of poplins.

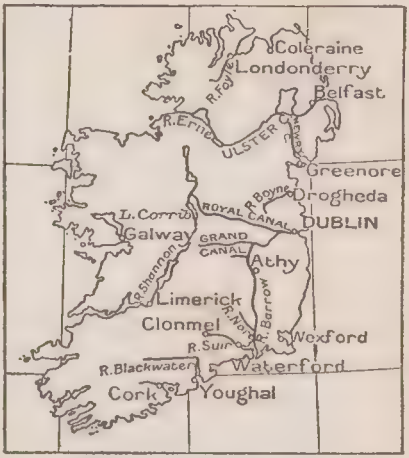


FIG. 27. Irish Canals.

The Boyne valley is one of the most fertile parts of the Central Lowland. Among the towns are Tara and Kells, both famous in Irish history and legend. Drogheda, its port,

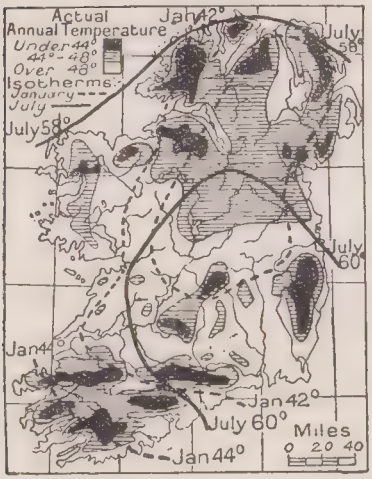


FIG. 28. Mean Annual Temperature not reduced to sea-level. January and July reduced to sea-level.

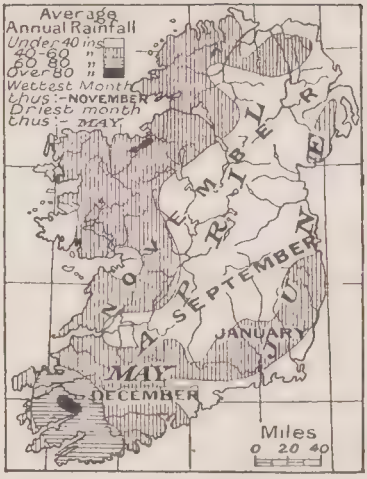


FIG. 29. Mean Annual Rainfall and driest and wettest months.

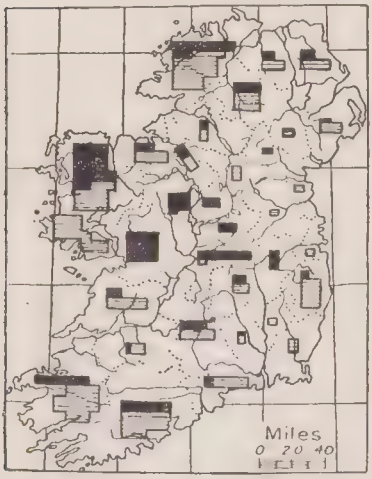


FIG. 30. Bogs. The black areas are drawn to show proportionately the extent of bog in each county; the shaded areas show the amount of mountainous waste land.

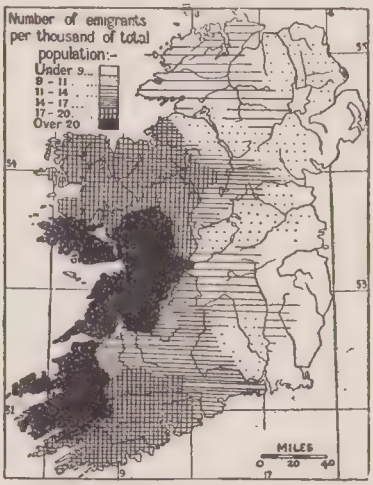


FIG. 31. Emigrants. The black areas show which districts supply most emigrants. The cross-shaded districts come next.

manufactures cotton and linen. Farther north, Dundalk, on Dundalk Bay, also a port, has similar industries. It commands the best route from Dublin and the eastern and most fertile part of the Central Lowland to Belfast and the lowlands round Lough Neagh.

Bogs and Loughs. The Central Lowland is a flat limestone area, covered in many parts with thick boulder clay. On this clay shallow waters accumulate, and peat mosses and other marsh plants grow abundantly. They form the Irish bogs, which are soft, green, unproductive areas. Sometimes a bog becomes so water-logged that it begins to slide away from its clayey foundation, and sweeps away roads, and even houses. When a bog is drained, the deep layers of dead moss are cut and dried into peat or turf for burning. This is practically the only fuel used inland, for Ireland has little coal. Peat is used for making gas and ammonia, and for moss stable litter. The largest bog in the east is the Bog of Allen, between the Liffey and the Barrow.

The reclaimed bogs and the drier parts of the Central Lowland make good pasture, and the chief occupations are cattle- and horse-rearing. The wet climate does not suit cereals, and potatoes are the staple crop. Notice the fewness of inland towns, which are small market centres, situated on the belts of drier ground, by which the roads and railways of the plain avoid the bogs.

The western half of the Central Lowland is wetter, as the maps in figs. 29, 30 show, and contains many marsh-bound loughs. The porous limestone is very soluble, and the rivers dissolve out their channels into wide loughs. Upper and Lower Loughs Erne are examples of such 'solution lakes'. Loughs Mask and Corrib are similarly formed, and the stream which connects them flows underground.

The Shannon. The western part of the Central Lowland is drained by the Shannon, which rises in the hilly north and flows through Lough Allen, a lake almost entirely surrounded by hills. Farther south it flows through Loughs Ree (with

Athlone at the southern end) and Derg (with Killaloe at the southern end), which are 'solution lakes'. At Killaloe the river passes between the Slieve Bernagh on the west and the Silvermine Mountains on the east. This is one of the most interesting parts of its course. At Lough Allen the Shannon is 168 feet above the sea, and at Killaloe, where it leaves Lough Derg, it is 108 feet above the sea. Between these two lakes it falls 60 feet in 80 miles, or only 9 inches in a mile. At Limerick, 20 miles below Killaloe, it is at sea-level, and has fallen more than 100 feet in 20 miles, or over 60 inches in a mile. Why does it fall so much in the last few miles of its course, and why does it follow what seems the most difficult route to the sea when there are easier routes across flatter country? The answer is that the surface of the land to-day is not the same as it was when the Shannon took its course. The whole of its basin was then much higher, and it followed the easiest course down the slope to the sea. In the ages which have passed since, the whole basin has been worn down. The softer rocks have been eaten away, and the harder rocks remain as hills. As these changes went on the Shannon gradually deepened its valley, which now forms a gorge through the hills round its lower course.

A number of tributaries enter the Shannon on both banks. On the right [1] bank the Suck is the largest, while the largest on the left is the Brosna. Both enter the main stream between Loughs Ree and Derg. Ballinasloe, on the Suck, has one of the largest cattle markets in Ireland. The estuary of the Shannon is long and narrow. Limerick, at its head, has a good harbour, and exports the cattle and dairy produce of the rich Clare and Limerick plains. It is also engaged in bacon-curing, condensing milk, and in small woollen and lace industries. There is one opening from the Shannon estuary to the north, the estuary of the Fergus, the river on which Ennis is built.

[1] The right bank of a river is the bank on your right-hand side as you look down stream.

The Western Highlands. On the west the Central Lowland is almost completely cut off from the Atlantic by highlands, which stretch from Sligo Bay to Galway Bay. They are not continuous, but are separated by arms of the Central Lowland, which reaches the sea at several points. Here ports have grown up, but they are less important than they would be if the inland region were more fertile. Cattle are bred in the lowland areas, but the highlands are rugged, poor, and thinly peopled.

Sligo Bay, with Sligo as its port, opens between the Ox Mountains or Sligo Highlands and the heights of Leitrim. The Moy Lowland opens to Killala Bay, with the small port of Killala, between the Sligo Highlands on the east and the Mayo or Nephin Beg Highlands on the west. Part of this lowland is formed by Lake Conn, and Killala Bay is its submerged northern end. A narrow strait separates the Mayo Mountains from the Achill Islands, the largest and most picturesque of Irish islands, in which Achill Head rises 2,200 feet out of the sea. A third arm of the Central Lowlands opens to Westport, on Clew Bay, between the Mayo Highlands and the Connemara Mountains. These lie west of Loughs Mask and Corrib, and form part of the broad peninsula between Clew and Galway Bays. Connemara is a picturesque but unfertile region of mountains, moors, bogs, and loughs.

Sligo and Galway are by far the most important of these western ports, for they are the outlets for the least poor regions and are much nearer to Dublin and the more fertile east.

Southern Ireland.

South-west Highlands. In the south-west the heights and valleys run east and west. This is very clearly shown by the shape of the peninsulas and bays of the extreme south-west coast. The rocks of the Earth's crust have been

bent into a series of wrinkles or folds which run from west to east. The upfolds or arches form mountain ranges and peninsulas; the downfolds or troughs form long inlets and river valleys. The northern downfold is represented by Dingle Bay, the lakes of Killarney, and the valley of the long eastward-flowing Blackwater. The second fold is represented by the inlet known as Kenmare River and by the Lee valley; a third by Bantry Bay and the valley of the Bandon. The bays are sunken lowlands, which become narrower and shallower towards their heads. Such bays are known as rias, and a coast of this type is known as a ria coast. A ria is very different from a fiord, which is generally deeper within than at the mouth, and sometimes wider. The mountain ridges (known in different parts by different names) fall by steep cliffs to the coast of these rias.

Three islands may be noticed. Valentia Island, at the end of Dingle Bay, is the most westerly weather station in the British Isles, and gives the first warning (other than wireless messages from ships) to the rest of the country of storms coming from the Atlantic. Bear Island, lying to the north of Bantry Bay, affords shelter to Bear Haven, useful as a naval station. Clear Island, the southern point of Ireland, is the western end of the most southern upfold. This, or Fastnet Lighthouse to the south-west, is a signal station where ships bound from America are first sighted and reported.

Of the short westward-flowing streams the Killarney River is the most important. It drains the Killarney Lakes, which lie at the foot of the lofty mist-clad heights of the Macgillicuddy Reeks (Carrantual, 3,400 feet). This is the most lovely part of a wonderfully beautiful county. Like other Irish waters, the rivers and lakes contain good salmon and trout.

The Southern Harbours and Wicklow Hills. The eastward-flowing rivers are much longer than those flowing west. Notice that when they reach the sea each turns sharply south, breaking through a gap in the highland to an estuary on

which a port is situated. Find on any map Kinsale on the Bandon, Cork on the Lee, Youghal on the Blackwater, and Waterford on the Suir. Kinsale, formerly of great importance, now yields to Cork, and is little more than a fishing town. The mackerel fisheries are especially important, the yield being landed either here or at Valentia. Cork has the advantage of a magnificent landlocked harbour. A gap in the hills to the north connects it by rail with the Central Lowlands. The line runs through the market towns of Mallow, Tipperary, Maryborough, and Kildare to Dublin. Cork is the outlet for the produce of the fine grazing lands of Munster, and exports cattle, butter (more than any other town in Britain), eggs, bacon, &c. The local industries are also determined by the pasture lands. They include woollen goods (Irish friezes, tweeds, &c.), agricultural implements, fertilizers, together with tanning, brewing, distilling, and bacon-curing. Queenstown, now known by its Irish name, Cobh, on one of the numerous islands in the harbour, is an outport and liner station. Waterford serves the lowlands of Kilkenny and resembles Cork in its exports. The Nore and Barrow, which flow into the north of Waterford harbour, like the Suir and other sluggish Irish streams, are navigable for a considerable distance. Clonmel, on the Suir, has condensed milk factories. Castlecomer, north of Kilkenny, lies on the edge of a small coal-field. Wexford, on the Slaney estuary, exports live stock, whisky, fish, &c., but the harbour is obstructed by a bar of sand which can only be passed by small vessels. As a ferry town it is now replaced by Rosslare outside the bar. Regular services run between Rosslare and Fishguard in South Wales.

The Wicklow Hills are composed of volcanic rocks mixed with hard slates and limestones. They contain lovely glens and small lonely tarns from which flow the head-streams of the Liffey, the Slaney, and the short but beautiful Avoca.

The steepness of the seaward slope may be seen in the way the railway between Wicklow and Kingstown hugs the shore. Granite is quarried at Killiney, and gold and copper were formerly found near.

The inland towns are market towns, as everywhere in Ireland, except in the north-east. They are somewhat larger than those in the centre and north-west. By far the greater part of the barley grown in Ireland is raised in the slightly drier basins of the Nore and Barrow. The land known as the Curragh, east of Kildare, is a singularly flat bare piece of land, used for military camps and manœuvres. Curragh means racecourse.

Summary. Ireland was anciently divided into four provinces, each of which had its stretch of sea-board and harbours, its infertile highlands, and its share of the rich central plain. These were Ulster, in the north (the present north-eastern State of Ulster has not quite the same area); Leinster, in the south-east; Munster, in the south-west; and Connaught, in the west. The fertile valley of the Boyne, one of the best parts of Ireland, anciently formed the kingdom of Meath. Most of western Ireland, whether mountain or plain, is infertile, partly because of the nature of the surface rock, which makes a poor thin soil, and partly because of the wet climate. The most fertile parts are river valleys, which are sheltered from the heaviest rains by mountains, and are covered by deep fertile soil. Other points to notice are the absence of woods and of coal. In spite of the extent of lowland, communication is not easy owing to the number of lakes and bogs. Except round Belfast, stock raising, horse breeding, and dairy farming pay best, and so none of these is an occupation which supports a dense population. These facts explain why the inland towns are all small market centres, and why all the large towns are on the coast and connected with the export trade. Fig. 18 shows the density of population, and Fig. 31 shows the districts from which most emigrants go.

ENGLAND AND WALES.

Natural Regions.

FIG. 32. Natural Regions of England and Wales.

Natural Regions. Fig. 32 shows a division of England and Wales into natural regions. These depend largely on the different kinds of rock of which our islands are built. Rocks weather into different kinds of soil, some poor, some rich and fertile, some letting water sink to great depths, some holding it up at the surface, some forming hard upstanding highlands, some soft and easily worn away into lowland river basins. To the farmer, soil is almost as important as weather; and to the manufacturer the rocks are all important, as a comparison of the coal-fields in fig. 21 with figs. 18 and 22-25 will show.

In the west there are three mountainous areas, all of ancient rocks, hard limestones, slates, and sandstones, with such volcanic rocks as granite and basalt:—

(i) *The Lake District.*

(ii) *The Welsh Highlands.*

(iii) *The West Country* (Cornwall, Devon, and Somerset).

(iv) *The Pennine Chain*, a fold of limestone, with coal on either side.

(v) *The Midlands*, a lowland of softer clays and sandstones, which touch the coast at the Dee, Humber, and Severn estuaries.

Then come the alternate clay vales and scarped ridges of South-east England, formed by

(vi) *The Limestone* (*or Oolitic or Jurassic*) *Belt*, a long ridge of moderately hard limestone stretching across England from the Cleveland Hills to Lyme Regis. All the coal and most of the ores of England lie west of this belt.

(vii) *The Clay Vales* of the Upper Thames and Great Ouse, *and the Fens.*

(viii) *The Chalk Belt*, gently rounded chalk hills (downs) stretching from Flamborough Head to the Isle of Wight. Chalk once covered all south-east England, but has been worn away in some parts, and buried under loose clays and sands in others, forming

(ix) *the London Basin*;

(x) *the Hampshire Basin.*

Northern England.

The Lake District is a highland mass of very hard rocks. Being very ancient it has been worn down, century after century, by rain and rivers, and in past ages by glaciers. In the centre of the dome high masses stand up, Helvellyn, Skiddaw, and Scafell (3,206 feet), the highest summit in England, which overlooks the deepest lake, Wastwater (258 feet deep). From these central points swift rivers flow out like the spokes of a wheel. Their upper valleys contain long and beautiful lakes which lie in rock basins scooped out by glaciers. Some of the lakes are in pairs, e.g. Derwentwater and Bassenthwaite. These once formed a single lake drained by the river Derwent; but the Greta and Newlands streams built a delta right across it, dividing it into two. All lakes entered by rivers tend to be filled up by their sediment, but as a rule the main river enters at the head of the lake. Sometimes, as at Langdale, a silted-up lake forms a level fertile plain.

The rainfall is the heaviest in England. The steep slopes retain little soil. Heather and poor pasture support sheep (fig. 6), and the country is thinly peopled (fig. 18). Old woollen industries remain in the rugs and shawls of Kendal. Lead has been mined from Roman times. Pencils are made of graphite at Keswick, but most graphite now comes from Ceylon. Keswick is one of many tourist centres. Coal is obtained from the north-west margin and exported from Maryport, Workington, and Whitehaven.

The largest population is on the coastal plains. Barrow-in-Furness, in the south, is a great industrial city. With a good harbour under the shelter of Walney Island, and very pure iron ore, it specializes in ship-building and great guns.

Lune and Eden Valleys. The Lake District is divided from the Pennine Chain by the Lune and Eden valleys. This is the easiest route, and is followed by the London and North-Western (L.N.W.R.) from Lancaster, via Kendal, Shap Fell (1,000 feet), Penrith, to Carlisle. Carlisle has always been of great importance. See how the mountain routes focus upon

it ; south from the Eden Valley and coastal plain, east from Newcastle, north from Edinburgh and Glasgow, through the vales of the Liddel, Annan, and Nith. Carlisle is a county

FIG. 33. Routes and Towns of Northern England. (For grouping of railways in this and later figs., see p. 73 and map at end.)

and cathedral town and railway junction, but as a port it has been replaced by Silloth, owing to the silting up of the Solway Firth.

The Pennine Chain is the backbone of Northern England. It

is a long north-south fold of old hard rocks, riveted to the Cheviot Hills in the north by flows of volcanic rocks, which disappear in the south under the clays of the Central Plain. It is flanked on either side by great coal-fields. The Pennine fold is built of limestone rocks, which were once covered with hard gritty sandstones known as grits, and perhaps also with coal measures. The coal measures and grits have been worn off the top. The former are found in pockets on the flanks of the chain, and the grits form sharp 'edges' or scarps, and flat-topped heights. Limestone, though hard, is porous, and water often sinks through it to a considerable depth, and flows in underground streams, dissolving out large caverns. These are very common in the picturesque southern Pennines, in the Peak District, and the Derwent Valley. At lower levels these waters gush out in springs. Some springs contain various medicinal salts, e. g. Harrogate, Buxton.

Owing to the dryness of the soil, and the height, the hills are high moors with stretches of short crisp sheep pasture. In early days wool was spun in the small villages on the Pennine slopes, and the looms were driven by the swift streams. Wool manufacture is still the leading industry in Yorkshire.

Northumberland and Durham Industrial Region. The Northumberland and Durham coal-field has a great advantage in being on the sea, for it is cheaper to carry heavy goods by water than by land. Three rivers cross the coal-field, on which three great groups of towns have arisen. In the north are the Tyne ports, Newcastle, North and South Shields, Gateshead, and Wallsend, from which a fleet of colliers carries coal to the North Sea and Baltic ports, and to London. These coal-fields have attracted many industries to them. Newcastle makes great modern guns, ships, machinery, and chemicals from salt, which is found in Durham. On the Wear is Sunderland, also a coal port and iron-smelting town. Then come the Tees towns, Darlington, Stockton, Middlesbrough, and Hartlepool. The first three are the great iron-working towns of Britain. A large quantity of iron ore is mined in the

Cleveland Hills to the south, but even this is not sufficient, and Swedish ore is imported. Locomotives, machinery of all kinds, boilers, steel plating, and steel ships are made at Middlesbrough and Hartlepool.

FIG. 34. Industrial District of NE. England, showing Distribution of Principal Towns.

The West Yorkshire and Nottingham Industrial Region. Farther south is the West Riding or Yorkshire coal-field. We have seen that in early days skilled weavers wove wool in the mountain valleys. This was before the age of the steam engine, which brought about the 'industrial revolution'. When that came in, in the early 19th century, the woollen industry

left the hills for the coal-fields and the huge factories and smoking cities of the plain arose. Thus grew up the woollen towns round Leeds. The woollen manufacture long ago outgrew the local supply, and wool is brought from Australia, New Zealand, and South Africa, through London and other ports, including Liverpool. Leeds, which commands the routes to Liverpool through the Aire, and shorter routes by tunnels through the Pennines, and Bradford have become great markets for wool and finished products. Leeds makes ready-made clothing, and, together with Bradford and Keighley, makes machinery for the woollen mills. Bradford, besides wool, has also great mohair factories. Huddersfield makes broadcloth. Halifax has the greatest carpet looms in the world. Dewsbury and Batley make shoddy of worn-out woollen fabrics. Barnsley has linen factories. Large glass works are established at Castleford, where the Calder joins the Aire. In the Don Valley, Sheffield and Rotherham forge armour plates, and make fine steel, axles, springs, cutlery, &c. The local rock makes excellent grindstones, which have long been used for putting a fine edge on cutting tools. Doncaster makes locomotives for the Great Northern Railway (part of the London and North-Eastern system). Nottingham, at the southern end of the field, makes lace, cycles, tobacco, and hosiery. Coal-mining is carried on, especially round Chesterfield.

Lancashire and Cheshire Industrial Region. West of the Pennines is the Lancashire coal-field, which is even more populous than the West Riding. Mark on a map the ring of cotton towns round Manchester. Rochdale is the only large town west of the Pennines with extensive manufactures of wool. Cotton is more brittle than wool, and except in a damp climate the fibre snaps. On the wetter western side of the Pennines, the climate is an advantage for cotton spinning. Coal is abundant and cheap. The double town of Manchester and Salford on the Irwell is the great cotton mart, and has profited by the cutting of a ship canal. Liverpool, opposite which is Birkenhead on the west bank of the Mersey, imports raw

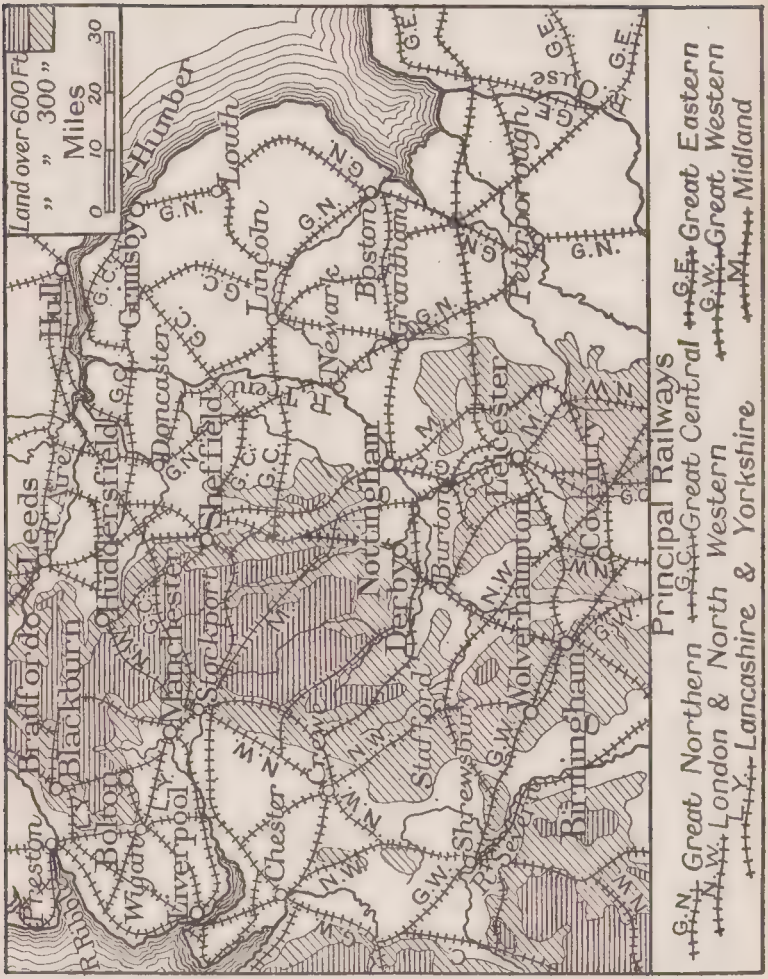


FIG. 35A. Routes and Towns of Central England.

cotton (mainly from the United States, Egypt, and India), wool, and food for a dense population. A bale of cotton bought in Manchester may be spun at Bolton, woven at Blackburn, and dyed at St. Helens or Widnes, where dyes and bleaching agents are made from the salt, &c., of the Weaver Valley. The machinery is chiefly made at Rochdale, Bury,

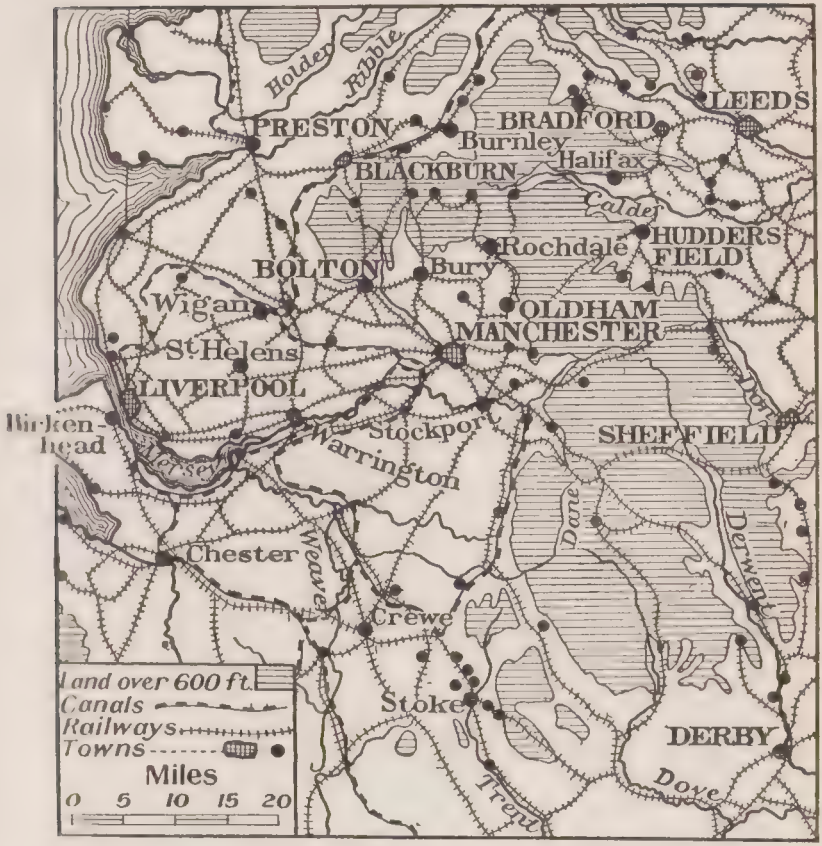


FIG. 35B. Industrial District of NW. England, showing Distribution of Principal Towns.

Oldham, and Manchester. St. Helens has great glass works.

The Potteries. At the southern end of the Pennine chain is the triangular coal-field of North Staffordshire. On this, local clay, salt from the Weaver Valley, and gypsum from Derby, have favoured the growth of the 'Potteries', i.e. the earthenware and china factories of the 'five towns' now united and called Stoke. Pottery travels best by water, and canals have been cut from the Upper Trent and the Weaver Valley.

By the Weaver and the Trent and Mersey canal come barges of china clay which has been shipped to the Mersey from Cornwall and Devon. Macclesfield and Congleton, midway between the two western coal-fields, are silk-weaving towns.

FIG. 36. Density of Population in Northern and Central England and in Wales.

Yorkshire and Lancashire outside the Industrial Areas. If you look at figs. 32, 35A, you will see that two arms run north from the Central Plain. The western arm forms the plains of Cheshire and Lancashire, crossed by the rivers Ribble,

Mersey, and Weaver. On the east the Pennine slope is longer. To the wide vale of York, the Swale, Ure, Nidd, Wharfe, and Aire flow east from the longer slope of the Pennines. Below the junction of the Swale and Ure the wide stream is known as the Yorkshire Ouse. The Vale of York is cut off from the sea by the limestone scarp (the steep face) of the Yorkshire Moors and the chalk scarp of the Yorkshire Wolds. The Derwent, which drains the Vale of Pickering between them, and the Don from the south-west, are other important tributaries of the Ouse. The Ouse is joined by the Trent from the south and the estuary of the two rivers forms the Humber. These plains are the great routes to Scotland and contain the historic towns which guard them. Outside the mining districts they are rich agricultural regions.

East of the Vale, the Moors and Wolds both end in cliffs on the seaward side. The openings of river valleys to the sea form small harbours, fishing villages, and watering-places (e.g. Scarborough and Whitby). Such towns, with their sands and fresh air, are the 'lungs' of the industrial district. The Lancashire 'lungs' are Blackpool, Southport, and Douglas (Isle of Man). The deep estuary of the Humber has given rise to the ports of Goole, Hull, Immingham, and Grimsby. The last, being next the sea, is the chief fishing port, from which fish from the Dogger Bank are rapidly sent to London.

Lincolnshire. The chalk belt continues southwards by the Lincolnshire Wolds, which are broken first by the Wytham and then by the Wash. Notice the remarkable course of the Wytham, north along Lincoln Edge, through Lincoln Gap, and then south-east between Lincoln Edge and the Wolds to the Wash. Lincoln means the colony (colonia) of the lyn or pool (cp. Dublin, Lynn, &c.). The pool is the bend of the Wytham which cuts the gap. The old Roman road ran along the high ground of the Lincoln Edge to avoid the marshes. Lincoln is a typical gap town. On the high northern edge of the gap stand the ancient castle and cathedral; the town lies below in the valley. A railway map shows the importance

of the routes through the gap Lincoln is a county and market town, and, like other towns that border the rich fen land, manufactures farm implements and agricultural machinery.

Railway Routes. The west coast route is by the L.N.W.R. from Crewe to Preston and Lancaster. Easier, and still more important, is the east coast route, by the main lines of the G.N.R. and North-Eastern (N.E.R.) which run by the vales of Trent and Ouse to Newcastle, and thence by the narrowing coastal plain to Berwick, near the line of the Roman road, and past many battlefields. York is the natural capital and market centre of the Vale of York. Its old walls and many Roman ruins still remain, and, as the seat of an archbishopric, it possesses a fine cathedral. Durham, with castle, cathedral, and university, is an old-world town picturesquely built on a high mound, surrounded on three sides by the Wear.

The routes across the Pennine Chain are more difficult. In the north the Tyne Gap gives an easy railway route between Carlisle and Newcastle. This was the line followed by the Roman wall from Carlisle to Wallsend. Between this and the Aire Gap only two railways cross the Pennines, one by the Tees Valley, the other by the Ure Valley (Wensleydale). The Midland (M.R.) route to Scotland and Ireland runs east of the Southern Pennines by Nottingham and Sheffield to Leeds. It uses the Aire Gap to reach Heysham for Ireland, and the Ribble and Eden Valleys for Scotland. Farther south the routes are easier and more numerous.

Wales.

Wales and the Welsh Marches. Fig. 37 shows that the Welsh peninsula, which lies between the Dee and the Bristol Channel, is a highland area, broken by long river valleys, and fringed with lowlands of varying width. Wales is built of hard ancient rocks, slates, grits, and limestones, some of which contain coal (see fig. 21). Its surface has been worn down by glaciers, which covered the northern part of Great Britain in the distant Ice Age.

In **North Wales** the mass of the land is occupied by the Snowdon Ranges, which run in a north-easterly and south-westerly direction, as is shown by the outstretched finger of Lleyn peninsula. North is the lowland of Anglesey (*ey* or *ea* = island), and a very narrow coastal ledge crossed by the Clwyd and Conway rivers. Snowdon, 3,570 feet high, is the hard resistant core of an extinct volcano, and is the centre of the highest mountain mass south of the Grampians. It is a picturesque rugged land, frequented by climbers and tourists, but supports only a scanty population of shepherds and quarrymen. The latter work in the slate quarries, the produce of which is shipped from Bangor and Carnarvon, at the ends of the Menai Strait. A denser population lives on the North Wales coal-fields, round the mining towns of Wrexham and Ruabon and the chemical works of Flint (salt from the Weaver Valley). A little smelting is done and pottery made, but the importance of these coal-fields sinks before that of Lancashire. The Lancashire towns, however, provide a ready market for agricultural, especially dairy, i.e. perishable, produce. Anglesey has more cattle for its size than any other county in England and Wales. Rhyl, Llandudno, and other coastal towns have developed into watering-places.

Central Wales mainly consists of the high wide moorland of Montgomery and Radnor, between the upper valleys of the Dee and Usk. The greatest heights are the Berwyn Mountains between the Dee and the Severn, Cader Idris, and Plynlymmon. Bala Lake, the source of the Dee, is an old glacial lake. Artificial lakes have been made by great embankments, e.g. Lake Vrynwy, the clear waters of which are carried off by pipes to Liverpool, and the lakes at the source of the Wye which supply Birmingham. The highlands pasture sheep, and Welsh mutton is famous. As in the Pennines, local wool gave rise to woollen manufactures in the mountain valleys. In spite of the competition of the West Riding, the flannel industries of Dolgelly, and the 'tweeds' of Welshpool and Newtown in the west, still survive. Fishing villages have developed

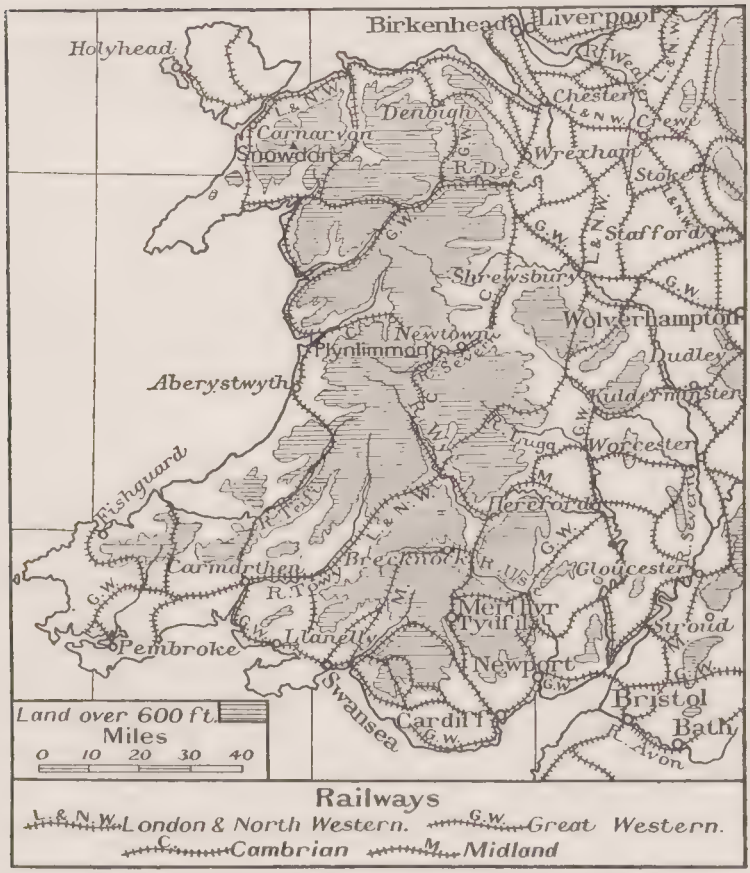


FIG. 37. Routes and Towns of Wales and the Severn Basin. (The Cambrian railways are now part of the Great Western system.)

into seaside resorts where there is good communication, either inland by rail, or outland by estuary, e. g. Barmouth and Aberystwyth (*aber* = mouth of). The lower warmer plains of Cardigan are, like Anglesey, dairy pasture.

In **South Wales** are the lower highlands of the Black Mountains and Brecknock Beacons, flanked west by the wide

plains of the Towy and Milford Haven, and south by the coastal plains of Glamorgan and Monmouth. These mountains run from west to east, and this direction can be traced in the peninsula of Gower and in St. Bride's Bay, where the sea has eaten out a band of softer rock between two more resistant belts of volcanic rock.

In early days the most important towns lay, as they still do, at points where the coastal roads cross a river. Such sites were marked by Roman camps and Norman castles, under the protection of which towns arose. The bridges barred river traffic, and ships were forced to unload below them. Small trading towns and churches grew up at these points. Cornish tin and copper were brought to the Glamorgan estuaries, and smelted with timber from the Brecknock valleys. After coal was used, the deep river valleys enabled miners to run horizontal shafts into the rich seams, and small towns at the mouths of the valleys have grown into the great smelting cities of Swansea, which manufactures tin-plate from the ores of the Malay Peninsula ; Llanelly, which works Spanish copper ; and Cardiff and Newport, with engineering and ship-building works. Inland, a network of railways opens up the great iron-smelting area that lies round Merthyr Tydfil. The valley bottoms are either cultivated, or blackened with great heaps of slag and the reek of many furnaces. The hills above, high, rounded, elongated, and sparsely covered with grass, have hardly an inhabitant (fig. 18). Where routes converge there are valley towns (Brecon) and tourist centres, especially where mineral springs occur (Llandrindod Wells, near Builth). As in Northumberland, the coal-field adjoins the sea. The ports of Cardiff, Swansea, Barry, and Newport export coal, especially the finest quality of smokeless coal (anthracite) used by the British and other navies. This coal-field is continued into Pembrokeshire, and Pembroke on the fine fiord of Milford Haven is a Government dockyard.

The Plains of Hereford are drained by the Wye, on which, near the junction of the main tributaries, lie the county and

market town of Hereford ('the ford of the army') and Monmouth. This is a specially favoured region. The old red sandstone soil is fertile, and the protecting hills give it a dry and comparatively warm and sunny summer climate. Hereford cider orchards, hop-gardens, and cattle are renowned. The Forest of Dean, west of the Wye, has local iron which was smelted first by local timber, then by local coal.

The Plain of Hereford is separated from the Vale of the Lower Severn by the Malvern Hills, with Malvern (mineral springs) at their eastern base. This long range of high hills, rising steeply from the plains, commands a wide view, and many beacons were lighted on it in olden days.

History and Routes. The easterly to westerly trend of the southern mountains of Wales, and the south-westerly to north-easterly trend of those of the centre and north, and the similar direction of the valleys, made communication from north to south very difficult, as a railway map shows. Wales has never been a united country. It has no capital. The town most easily accessible from all parts of Wales is Shrewsbury, outside the Principality. This lack of unity is shown by the difference of speech between North and South Wales. The lowlands of the Dee and the Severn were in times past a constant temptation to the shepherds of the poor upland pasture.

The coastal plains, their long eastward valley routes, and the disunion of Wales, facilitated their conquest from the lowlands. The Romans built four great camps to guard the border, Chester commanding the north coast route, Wroxeter that of the Severn Valley, Worcester the Teme Valley, and Gloucester the south coast route. Roman roads north and south led to outposts at Carnarvon and Caerleon-on-Usk (*Caer* or *Car* = fort). When the Anglo-Saxons seized England, the highlands served as a refuge for the Welsh, and preserved their language. Offa, King of Mercia, built his famous dyke at the foot of the hills to check their raids. For a similar purpose William I established the earldoms of Chester, Shrewsbury, and Hereford. Later, the Norman barons were

allowed to hold whatever land they conquered on the border, and they built their castles higher up the valley-routes at Montgomery, Ludlow, and Monmouth. The easiest advance was by the wider coastal plain of the south coast, past the castles of Chepstow, Newport, Cardiff, and Swansea, to Pembroke, 'A little England within Wales.' The Welsh made their last stand in the northern highlands. Llewellyn defied Edward I in the Snowdon Range, and drew his food supply from Anglesey. Edward and his army followed the coast, and built the castles of Conway and Carnarvon, starving the Welshmen out of the barren highlands. The railways follow these historic routes. In the north, the L.N.W.R. line from Crewe and Chester follows the coast to Bangor, and is carried by a tubular bridge across the strait to Holyhead (packet station for Dublin). In the south, New Milford and Fishguard are ports in steamer connexion with Waterford and Rosslare in Ireland. The Great Western (G.W.R.) main line follows the coast and connects with Bristol or Swindon by the Severn Tunnel, or with Gloucester by Chepstow.

The West Country.

The Coasts. This has a sunken coast line, where volcanic hills have been converted into peninsulas (Lizard and Land's End), and river mouths into long far-reaching estuaries. The estuaries form land-locked, easily protected harbours, commanding the Atlantic routes. From these the great Elizabethan seamen sailed 'Westward Ho'. From Barnstaple and Bideford, from Plymouth and Falmouth, Drake and Hawkins went out to spoil the treasure-fleets of Spain and defeat her Armada, and Gilbert and Raleigh to found our first colonies of Newfoundland and Virginia. Plymouth, to-day, near the extreme west of the English Channel, is a port of call where many ocean steamers land mails and passengers. Devonport, close by, and Falmouth are our western naval stations. Brixham, Penzance, and St. Ives are used by the fishing fleets which follow the pilchards ('sardines'), herring, and

mackerel along our southern shore. The mild waters make the coast well suited for invalids. Torquay, on Tor Bay, is a popular winter resort. Ilfracombe and Lynton are watering-places on the high north coast of Exmoor.

The Hills. Inland is a chain of wide vales, the Vale of Somerset, drained by the Tone and Parret, the Vale of Devon drained by the Exe and Taw and the Vale Tamar. These are separated in the south by the Blackdown Hills, Dartmoor, and Bodmin Moor. These are masses of hard granite, upstanding in flat-topped moors above the softer sandstones of

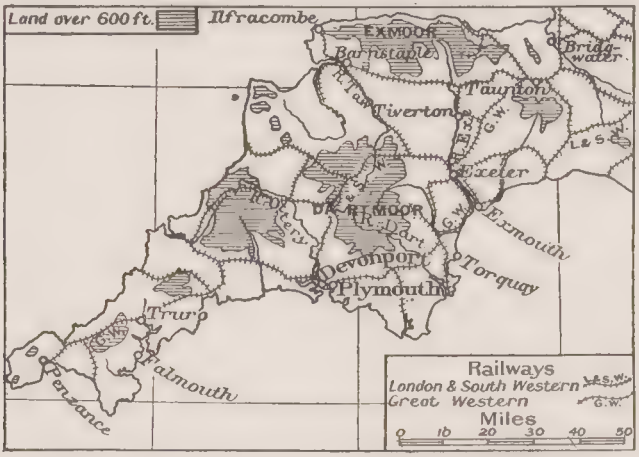


FIG. 38. Routes and Towns of S.W. England.

the river valleys. These granites coming up white hot from the depths of the earth long ago, baked and cracked the surrounding layers of rock, sweating out the ores that lay therein, so that the metal ran and set in the cracks round the edges, forming veins ('lodes') of tin and copper. These lodes have been mined from time immemorial. Many are exhausted, but some still supply ores, which are sent to Wales. Granite, when weathered, forms a tough white clay (kaolin). This upholds the water on Dartmoor, causing dangerous peat-bogs, which sometimes swallow up the Dartmoor ponies. This kaolin is the best china-clay, and is shipped from Fowey to

the Potteries. The upland pastures, especially the sandstone heights of Exmoor, and the limestone of the Quantocks and Mendips, raise sheep.

The Vales. The vales raise cattle. Devon (cp. Hereford) has a mild climate and a fertile Red Sandstone soil. It is a peaceful land of red cattle (Devonshire cream stamps it as dairy pasture) and red cider apples. Taunton in the Vale of Somerset is the chief of many small market towns. North of Taunton much of the land is reclaimed marsh. The Isle of Athelney, where the Tone joins the Parret, was the fen refuge of Alfred the Great, near the ancient abbey of Glastonbury. The lead of the Mendip Hills to the north-east has been worked since the earliest days. Fig. 38 and the atlas will show the railways which converge upon Exeter at the head of the Exe estuary. Exeter was the camp by which the Romans held the Cornishmen or West Welsh in check. It has a fine cathedral.

The Scilly Islands, off Land's End, have an even milder climate than Cornwall. They grow spring flowers and early vegetables for the London and country markets.

The Midlands.

The Central Lowlands. Compare figs. 32 and 35. You will see that the plain of the midland shires is a wide lowland, shaped like a triangle, widest in the north, where it is bounded by the butt end of the Pennine Chain, and narrowing in the south between the Welsh Highlands and the scarps (Cotswolds and Northampton Heights) of the limestone belt. Birmingham lies roughly in the centre of this region. The Midlands are drained by three streams, which flow sluggishly along the soft clays, parallel to the highland boundaries, and receive their longest tributaries from them. In the north the middle valley of the Trent receives the Upper Trent, Sow, Dove, and Derwent, from the Pennines, and the Tame and Soar from the south. In the west, the main stream of the Severn runs south-

wards parallel to the Welsh Highlands. It rises in Plynlymmon, near the west coast of Wales, and after flowing north-east across Wales, enters England above Shrewsbury. Lastly, the Warwickshire Avon follows the direction of the limestone scarp and joins the Severn at Tewkesbury. The soft clays and sandstones form a low undulating damp country, with no conspicuous heights except near the coal-fields. Apart from the industrial areas the central lowlands are agricultural, and the heavy soils suit cattle. Dairy-farming and market-gardening are important near the industrial markets. Orchards and hop-gardens are important in the lower valley of the Severn and Avon.

The Heights. The lines of hills and coal-fields (see fig. 21) all lie in the north, and are continuations of the Pennine system. If we may compare the Pennine Range to an arm, we may say that though the wrist is buried, the four fingers and a thumb of limestone, volcanic rock, and coal are bent up above the level clays of the Midland Plain. The thumb lies to the east and sticks up in the Leicestershire coal-field, with Ashby-de-la-Zouch in the middle of it, and the granite heights of Charnwood Forest (moorland). The first finger is the long narrow Warwickshire coal-field between Tamworth and Nuneaton. The second and fattest finger is the Black Country, with the narrow north-south line of the Clent-Lickey Hills and Birmingham on its southern margin. The third finger is the South Staffordshire coal-field, which lies along the Severn between Wellington and Kidderminster, with a similar north-south line visible in the Clee Hills. Lastly, the little finger curves westwards, from the granite and volcanic Wrekin to the Shropshire coal-field immediately south of Shrewsbury.

The Black Country. Great manufactures are carried on in the Black Country. Coal is found with iron ores, limestones, and clays (used in casting). North-west of Birmingham are the great ironworking towns, Wolverhampton with huge foundries, Walsall, Wednesbury, Dudley, and Stourbridge, which make earthenware and ugly blue Staffordshire bricks. This

area is linked by rail, tramways, and canals. Black with slag-heaps and smoke, it well deserves its name. Birmingham itself is engaged in finer metalwork, small arms, cycles, bedsteads, screws, and cutting tools. 'Brummagem' knives were known in the fifteenth century, when the iron was smelted with

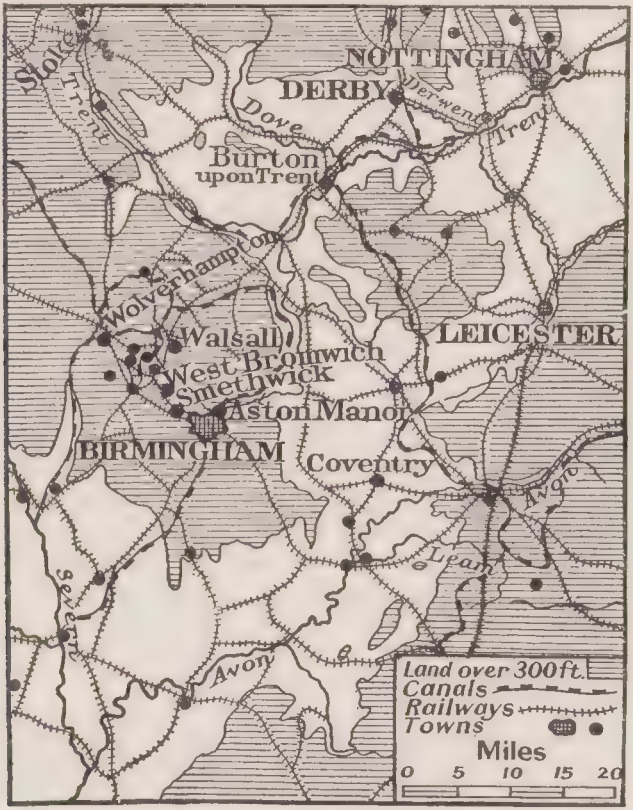


FIG. 39. Midland Industrial District, showing Distribution of Principal Towns.

wood from the forests of Arden in Warwickshire. It is the great market for this great industrial district, served by the almost equidistant ports of Liverpool, Hull, Bristol, and London. Some of the older towns to the south prosper through special industries. Coventry makes motor-cars and

cycles; Bromsgrove, west of the Lickey Hills, makes chains; and Redditch, east of them, has the largest needle and fish-hook factories in the world.

Other Industrial Areas. The red clay itself is used for earthenware, bricks, &c., and often contains salt. The Leicestershire and Warwickshire coal-fields are mining districts, but road metal, important in clay countries, is quarried in Charnwood Forest and at Nuneaton. Leicester (*Legionum castra* = Camp of the Legions) manufactures boots and shoes (leather from the lowlands) and hosiery (wool from the nearest uplands). Burton-on-Trent has vast breweries, for which the local water is specially suited. The other two coal-fields are comparatively insignificant. Wellington has iron-foundries. Kidderminster makes carpets. Shrewsbury, on a height nearly surrounded by the Severn, is an old county and market town.

Salt is pumped up in the form of brine at Northwich, Middlewich, and Nantwich. The ground sinks so that in Northwich houses may be seen leaning over in all directions. Droitwich is a salt town with medicinal brine baths, and furnishes the material for glazing the porcelain made at Worcester, a cathedral city near the confluence of the Severn and the Teme. Saline springs occur at Malvern and Leamington.

Towns of the Lower Severn and Warwick Avon. The river soils of the Lower Severn have large hop-gardens and orchards (Evesham), and many ancient market towns, e. g. Worcester, Tewkesbury, Gloucester. The last has yielded as a port to Bristol, just as Chester has given place to Liverpool. On the Avon is Stratford-on-Avon, the birthplace of Shakespeare, our greatest poet. Close by is Warwick, an ancient Roman town, with a fine castle. Rugby, further east, has electrical works, and is a great railway centre.

The main routes are given in fig. 35 A, B. The L.N.W.R. works are at Crewe, the M.R. works at Derby.

The Scarp Lands and Clay Vales.

The Limestone Belt. We have seen the northern end of

this in the Cleveland Hills and Lincoln Edge. This scarped ridge (the scarp is the short steep slope overlooking the Central Plain) turns south-westwards across England in the Northampton Heights, Edge Hill, and the Cotswolds, and ends in the Dorset coast and Portland Bill. The well-drained heights are sheep pasture, where there is less foot-rot than on the clay plains. Here arose the well-known breeds of 'Cotswolds' and

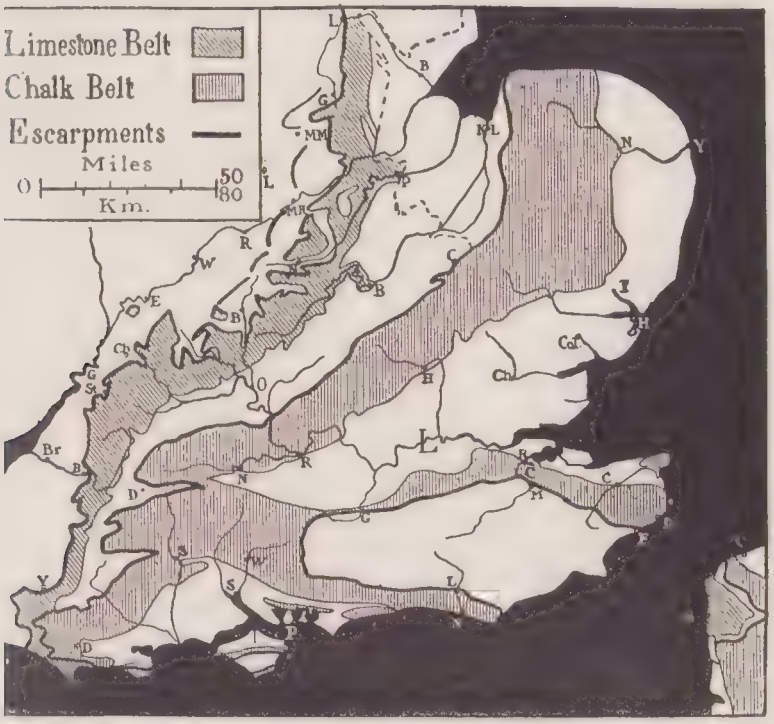


FIG. 40. The Scarplands of England.
The dark lines edging the shaded ridges indicate the steep escarpments.

'Oxford Downs' sheep. The lower lands are agricultural, with numerous market-towns, some of which, like Lincoln, lie on gaps that have determined the main routes. Some have farming industries, e. g. Grantham and Kettering (agricultural implements from local ores); Melton Mowbray (pork pies),

FIG. 41. Routes and Towns of SE. England.

V. A Cotswold village

VI. A Norfolk Broad

VII. Part of Falmouth Harbour

VIII. West coast of Scotland: Loch Sunart

Northampton (boots and shoes, ironwork). Buckingham and Banbury are other ancient gap towns. The villages on the Cotswold slopes were great seats of the woollen industry. Witney, near Oxford, gave its name to Witney blankets. Stroud makes red army cloth, the water being particularly good for fixing dye. Bradford-on-Avon makes worsted, and Frome broadcloth. Bath, in the gorge cut by the Bristol Avon, has been a famous spa since Roman times. Bristol, at the head of the Avon estuary, has been a great port for centuries. Under Henry VII Bristol merchants sent many vessels to discover 'the Iles of Brasil', and their servant, John Cabot, discovered Newfoundland. Besides regular services to the Irish seaports, Bristol trades with the West Indies, and has tobacco, cacao, and sugar industries. Building-stone is quarried at Bath and Portland. Throughout the region the houses are of limestone, and rough stone walls take the place of hedges.

The Clay Vales. The limestone belt is drained to the south-east. Between it and the chalk scarps lies a valley of soft clays traceable in the Vale of Blackmoor (Dorset), the Vale of the White Horse (under the scarp of the Berkshire Downs on which a figure of the white horse is cut), the spreading waters of the Upper Thames, the Vale of Aylesbury, and the Fenland drained to the Wash. Much is reclaimed flood-land forming the richest dairy pasture in the kingdom, and producing Dorset butter, Cheddar cheese, Aylesbury ducks (the railway from Aylesbury to London is known locally as the 'milky way'), and Stilton cheese. Oxford, at the junction of the Thames and Cherwell, is the centre of the Oxford Clay Vale, where routes from all directions unite. Surrounded on three sides by rivers and marshes, it had an ancient camp and a Norman castle, and became the seat of the first university of England.

The Fenland. Till within historic times this was a region of reed beds and mud flats, flooded at high-water, and supporting only a small population of fishermen and wild fowlers. The towns were on the low hills, then islands, of Peterborough and Ely (Eel Island), where rich abbeys arose. The latter

was the fen refuge of Hereward the Wake, against whom William I built a castle at Cambridge on the edge of the Fens. Cambridge, the second university in England, resembles Oxford in its fen-bound isolation. Other ancient towns were built just beyond the flood area, e. g. St. Ives and Huntingdon on the Ouse, Stamford on the Welland. All are important market centres. The Fens have been drained, and form rich black agricultural land. The flat green plains are planted with cereals, and root crops, with brilliant patches of yellow mustard, and round Wisbech, acres of strawberries and orchards. The fields are divided by long straight dykes, which carry the water off into deeper drains embanked on either side. This water is held back by strong sluices, and can only enter the rivers when the water is low. The Fen rivers are also embanked, and at high tide their waters rise 15 to 20 feet above the level of the surrounding land. Sea banks bar out the tides of the Wash, the salt marshes of which are still being reclaimed. Boston and Lynn, once the great ports of East Anglia, have declined owing to the continued silting up of the Wash and to railway competition.

The Chalk Belt. This forms a continuous belt of scarped ridges in the East Anglian Heights, the Chiltern Hills, and the Berkshire Downs. These, like the limestone scarps, have their steep slopes and short rivers to the north-west and their long slopes and rivers to the south-east. The upper Thames flows through what is known as the Goring Gap, between the Chilterns and the Berkshire Downs. South of the Berkshire Downs the chalk area widens to the broad plateau of the Hampshire Downs and Salisbury Plain. This is the central knot of the chalk, and from it one arm, the West or Dorset Downs, runs south-west to the Isle of Purbeck, and two other ridges run east, the North and South Downs, which end respectively in the Isle of Thanet and Beachy Head. These chalk lands stand up as hills, not because of their hardness, but because chalk is an extremely porous soil. Water sinks deep down into it, and there are few surface streams or rivers

to wear the land down. The dry soil with short crisp turf makes excellent sheep pasture ('South Down' mutton). Owing to absence of water the villages generally lie at the foot of the escarpment where springs emerge. The bare unfenced expanses of the downs are used for military camps and manœuvres (Salisbury Plain), for aeroplane work, and for racing stables (Epsom, Newmarket, Newbury). The chalk is thinly peopled, and the chief towns command gaps in the chalk rim, through which routes run from one basin to another.

The Vale of London and East Anglia. The chalk of the Chilterns passes beneath the Thames and reappears in the North Downs. The chalk has in fact been bent down, forming a basin now filled with clays and sands, across which run the Kennet and Lower Thames. Some of the sand is poor soil covered with pines or gorse, but the mixed clays and sands make excellent farming country.

In East Anglia, Norwich on the Wensum is the most important place. It still has great sheep fairs, but the woollen industry is now superseded by the making of agricultural implements, boots and shoes, and the preparation of locally grown mustard, starch, &c.

The coast is smoothed by strong currents, which are rapidly wearing it away. Part of this material is banked up along the coast. Wherever hard cliffs ('good sands') or river mouths occur, small fishing villages have grown into seaside resorts; e.g. Cromer, Yarmouth, and Lowestoft, on the Yare and Waveney estuaries. At the heads of the deeper Essex estuaries ancient bridge-towns grew up. Ipswich, on the Orwell, makes agricultural machinery and railway plant. Colchester, on the Colne, was a Roman fort, and famous then as now for oysters. Harwich, on the Stour inlet, is a ferry town or passenger port, with daily sailings for the nearer continental ports.

Last comes the deepest and most important historic estuary of all, that of the Thames. Its bridge-town is London, the capital of England and the British Empire.

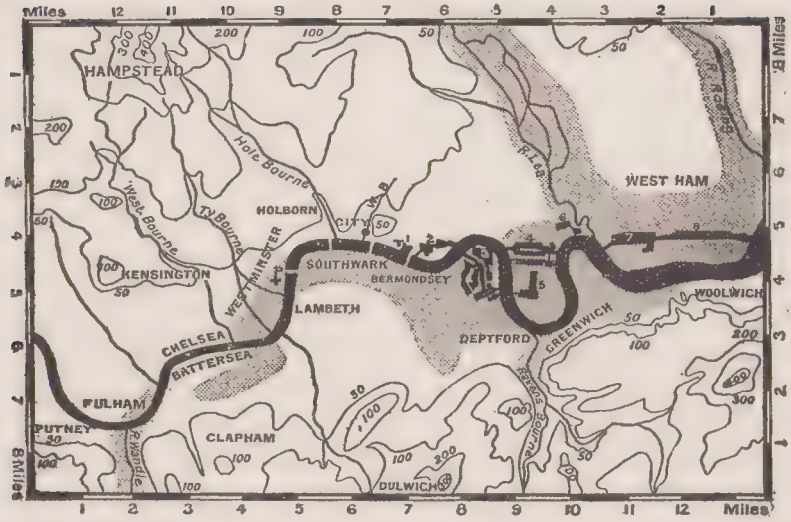


FIG. 42. The Site of London.

FIG. 43. London Docks and the Commodities brought to them.

London. In ancient times the shores of the Thames estuary were marsh (shaded in fig. 42). London is built where these marshes narrowed and high ground first appears on both sides of the river, and the construction of a bridge (London Bridge) was possible. Below this bridge, vessels discharged and sold their cargoes. Their crews, and also such land travellers as crossed the Thames by the bridge, required food, inns, &c. The City of London, St. Paul's Cathedral, the 'city' of the business man, with miles of docks, warehouses, markets, factories, shipping and insurance offices, banks, and exchanges, have grown up round London Bridge. The docks, easily dug in reclaimed marsh, with their chief imports, are shown in fig. 43. Special manufactures depend on each dock, e.g. West Ham soap on West African palm-oil (East India Docks); Deptford leather-tanning and glue industries on cattle landed at Deptford. Here the Tower of London was built to command the bridge, and overawe the not always loyal city. The industrial area has now spread down the estuary. Greenwich and Blackwall have docks, and Woolwich a great arsenal. Chatham, at the mouth of the Medway, is a naval dockyard. The forts protecting the estuary are at Tilbury, Gravesend, and Sheerness.

London was more than a bridge-town. Above the bridge the river in old days grew wider and shallower. The banks were fringed with islands, now drained (e.g. Bermonds-ey, Chels-ea, Putn-ey). On one of these, at the lowest ford, the kings built Westminster Palace. In Westminster are St. James's and Buckingham Palaces, Westminster Abbey, the Houses of Parliament, the War Office, and other Government buildings. Here too are the royal parks, and round them the richer quarters and the more expensive shops, theatres, &c., of the 'West End'. The ground is higher and healthier, and lies windward (i.e. west) of the smoke and smells of any industrial centre.

To see why London became the capital we must take a wider view and look at the routes it commands. The Thames estuary faces the Scheldt, Rhine, and other waterways of the Low Countries. These were all important as markets for English wool. More important still are the great routes converging on the Strait of Dover, from the Baltic, the Mediterranean, and the New World. Again, London lies in the heart of the scarplands, and from it the routes run out in all directions, up the gentler slopes, and through the gaps of the chalk and limestone hills. This is shown by the railways of fig. 44.

On these lines are the next important towns in the Thames basin. Hertford Castle guarded the Lea valley. St. Albans and Luton (straw-plaiting) lie at the ends of the gap leading to Bedford. High Wycombe, in another important gap, makes chairs from the Chiltern beech forests. Due south of the Thames is the residential suburb of Croydon. Up the Thames are Kingston, Richmond, the royal residences of Hampton Court and Windsor, Henley with its regatta, and industrial Reading (biscuits and carpets) at the lower end of Goring Gap.

Railways. Nearly a dozen great lines of railways, and others of less importance, converge upon London (see fig. 44). Those from the north cross the limestone and chalk escarpments in the natural gaps, and follow the river valleys wherever possible. The three great through routes from Scotland have already been traced to the southern end of the Pennines. From Crewe, where the lines from North Wales connect, the West Coast or North-Western route runs south-east, passing the limestone heights in a tunnel near Rugby and the chalk heights in the dry Berkhampstead Gap. The Midland and Great Central routes follow the Soar valley to Leicester, from whence the Great Central runs south to Rugby, passing the chalk heights by the Wendover Gap and also by the Wycombe Gap farther to the south-west, while the Midland crosses the limestone near Market Harborough, passes Bedford, enters the chalk near Luton in a gap drained by the river Lea, and reaches London through St. Albans. The Great Northern

route runs farther east, where the heights are insignificant, passes the margin of the Fens at Peterborough, and runs due south to London through Huntingdon and Hatfield. Farther east the Great Eastern brings the Fens and East Anglia into communication with the capital, the main lines passing from

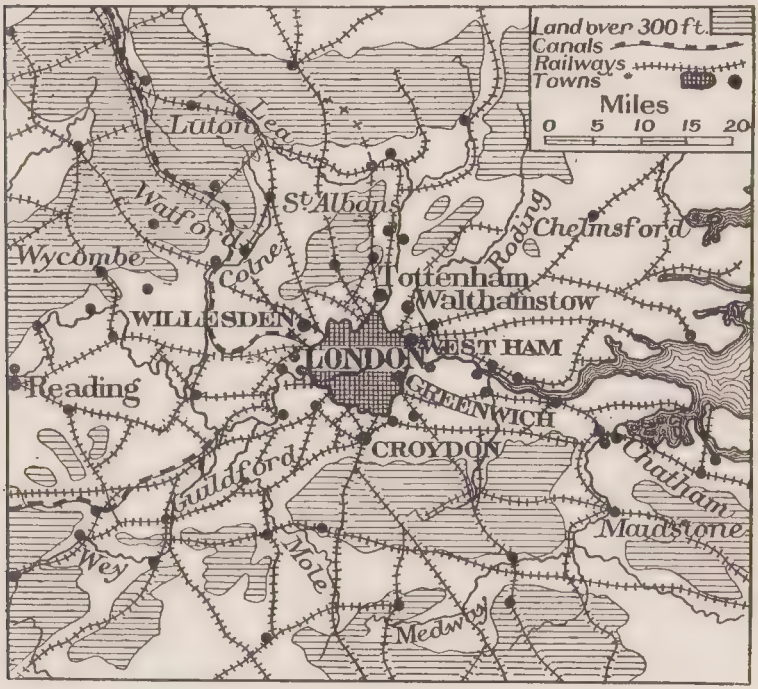
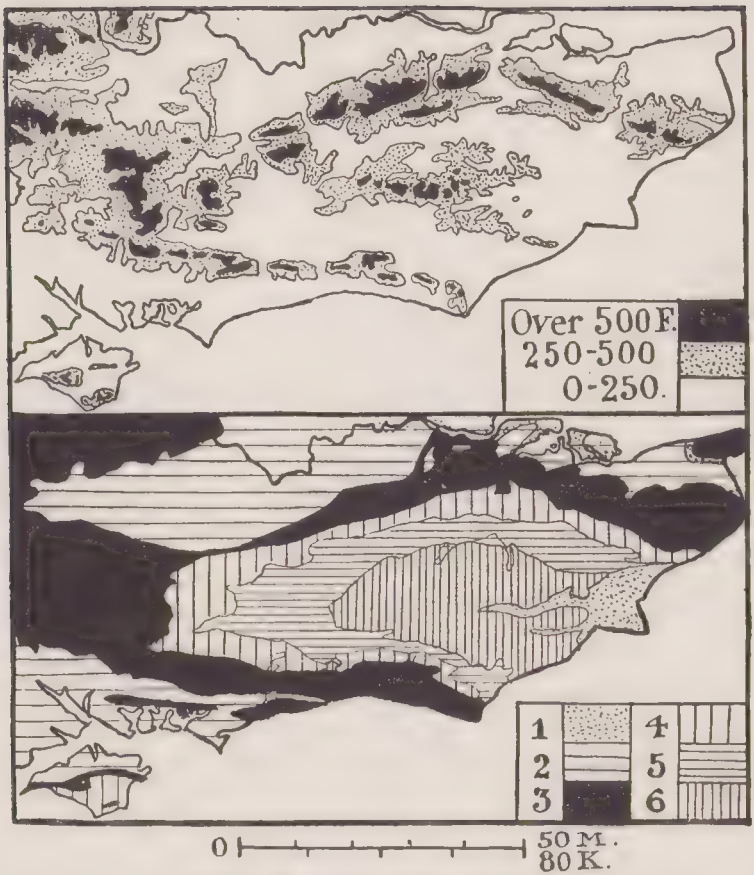


FIG. 44. The position of London.

King's Lynn by Ely and Cambridge, and from Norwich and Yarmouth through Ipswich, Colchester, and Chelmsford.

The Great Western system brings the whole district between North Wales and South Devon and Cornwall into communication with London, connecting it with the great ports and naval stations on the west and south-west coast, as well as with the busy industrial districts of the Midlands. From Birkenhead, on the Mersey, opposite Liverpool, a line runs by Chester, Shrewsbury, and Birmingham, and the Wycombe Gap to London, or by the



FIGS. 45 and 46. Physical Features and Rocks of England between the Lower Thames and the Channel. In fig. 46 1 = alluvium, 2 = tertiary clays, sands, &c., 3 = chalk, 4 = upper and lower greensand with gault clay between, 5 = weald clay, 6 = Hastings beds of sandstone, &c. Cf. fig. 47.

FIG. 47. Section from the Channel to the Thames across the Wealden region. Cf. figs. 45 and 46.

Cherwell valley, to Oxford, where it joins the line from Worcester, which has crossed the Cotswolds by the Evenlode valley. At Didcot the line from Oxford joins the great West of England lines, those from South Wales coming by Swansea, Cardiff, and Newport, either to Gloucester, and thence by the Stroud valley to Swindon, or by the Severn Tunnel and tunnels through the Cotswolds to the same place. There they are joined by the lines from Bristol (where the Devon and Cornwall lines connect) and Bath, through the Avon Gap. From Didcot the line runs due east to London through Reading, where a shorter line from the south-west of England, utilizing the Vales of Pewsey and the Kennet, comes in. The line passes between the Marlborough and Chiltern heights by the Reading Gap.

London is connected with the south coast by lines through the gaps in the Chalk Downs or in tunnels through them. The line from London to Portsmouth uses the Guildford Gap in the North Downs; lines to Brighton go by Croydon and tunnels through the North and South Downs. The line to Newhaven for Dieppe follows the same route through the North Downs, and uses the Ouse Gap in the South Downs at Lewes. Folkestone and Dover are reached by a line which tunnels under the North Downs near Knockholt and the Quarry Hills (or Ragstone Ridge) at Sevenoaks. Another runs along the northern margin of the chalk by Chatham and Canterbury, and enters Dover by a tunnel through the chalk. Of the principal lines entering London (1) the Great Western gives its name to a group or company which includes this big system and many smaller, (2) the London and North-Western and the Midland belong to the London, Midland, and Scottish group, which also includes the North Staffordshire, Lancashire and Yorkshire, and Furness, and the Caledonian, Glasgow and South-Western, and Highland in Scotland, (3) the Great Northern, Great Central, and Great Eastern belong to the London and North-Eastern group, which also includes the North-Eastern, North British, and Great North of Scotland, and (4) the Southern group includes the London and South-Western, the London, Brighton, and South Coast, and the South-Eastern and Chatham.

The North and South Downs and the Weald. The Weald is a lowland lying between the North and South Downs. Its clays and sands are older and softer than the chalk. Wind and rain have worn away a great dome of chalk, exposing the softer rocks beneath. The rough edges of this chalk dome stand out as the North and South Downs. This all happened before the days of man. The Wealden uplift was then continued into France, but the sea has eaten through the land forming the shallow Dover Straits, and is still wearing away the white chalk cliffs of Dover and Calais. Notice where the chalk juts out into the sea, the North Downs in the Isle of Thanet, and the South Downs in Beachy Head. The waste from these headlands has been washed up by currents, which have built up the long shingle projection of Romney Marsh and Dungeness, and silted up many ancient ports. The Goodwin sands were once rich meadows owned by Earl Godwin. A map of the Weald shows that the main streams run north or south through gaps in the chalk rim, but that within the escarpments their tributaries come from east and west in clay valleys parallel to the scarps.

This south-eastern corner is the link between England and the Continent. Hence its great importance and prominence in history. Dover and Lympne were Roman ports, then came the 'Cinque Port' union of Sandwich, Dover, Hythe, Romney, and Hastings. Communication is now through the ports of Dover (to Calais, Boulogne, and Ostend), Folkestone (to Boulogne and Flushing), and Newhaven (to Dieppe). Other coastal towns are fishing and seaside resorts, e.g. Margate, Ramsgate, Deal, Hastings, Eastbourne, and Brighton.

The interior of the Weald was formerly covered with a dense forest. This fed many ironworks (local iron) and supplied oak timber for old warships and others. The ancient woodland (except the small patch of Ashdown Forest) and the ironworks have vanished, and the Weald is now agricultural, raising cattle and sheep on Romney Marsh and on the Downs. The rich Medway soils have orchards, hops, and market-gardens.

The Vale of Kent deserves its name of the Garden of England, and its prosperity is shown by the many towns and villages. These may be looked out in a large map.

Defence against the Continent is important as well as traffic with it. Dover is strongly fortified, and ancient castle and market towns are placed in the chalk gaps, by which routes pass inland. In the south the castles of Arundel and Lewes held the gaps of the Arun and Ouse. In the north, notice Guildford on the Wey, Dorking on the Mole, and Maidstone (with breweries and paper-mills on adjoining chalk streams) on the Medway. Canterbury is the ecclesiastical capital of England. Ashford at the other end of the Stour Gap has great sheep and cattle fairs. The military centre is Aldershot, built among open sandy moors where its troops can rapidly reach London, Portsmouth, and the south coast.

The Hampshire Basin is a downfold, i. e. a trough of chalk filled with younger sands and clays washed from the surrounding chalk heights (cf. the London Basin). The south has a sunken and much-worn coast, as is shown by the sunken river valleys of the Solent and Spithead, which separate the Isle of Wight from the mainland, and by the harbours of Portsmouth, Southampton Water, and Poole. Southampton Water, the estuary of the Test and Itchen, has four tides a day. One comes up the Solent, and another, two hours later, by Spithead. This makes Southampton peculiarly accessible to shipping. Portsmouth harbour is backed by a long ridge of chalk, now strongly fortified, and commanding the harbour with heavy guns. Portsmouth is our largest naval dépôt, with huge docks, slips at which Dreadnoughts can be built, armouries, and the Royal Naval College. Spithead and the Solent are protected by outlying forts. Southampton, in the heart of the basin, is a busy port, a ferry town for the Channel Islands and France (Havre), and a packet station for Atlantic and other liners. Bournemouth early last century was a small fishing village on open moorlands, but the firm sands, warm sheltered climate, and fragrant pine woods have made it a popular

winter resort. Inland, belts of clay support mixed farming and forest, but the lighter sands are moorland. These form the beautiful woods and moorlands of the New Forest between the Avon and Southampton Water. Small winter stations are found on the mild coast of the Undercliff of the Isle of Wight. Newport is the capital of the island, and Cowes, on sheltered inland waters, is a yachting centre.

Two roads lead north by gaps in the chalk, one by Salisbury, the other by Winchester, both cathedral cities. Near the former is the stone circle of Stonehenge, a prehistoric monument about which we know little. Another route runs west by the Frome Valley and Dorchester. South of the Frome is the so-called Isle of Purbeck, a beautiful country with varied ridges of chalk and limestone running parallel to the sea. Swanage is a watering-place, Weymouth a small port and ferry town for the Channel Isles. The chief export is Portland stone.

SCOTLAND.

Physical Features.

The Border, the boundary between England and Scotland, is formed by the Solway Moss, the Cheviot Hills, and the Lower Tweed. It is a natural boundary, difficult to cross, and still thinly peopled.

Scotland is the most mountainous of the three kingdoms. The Highlands are highest in the west, while the Lowlands are most continuous in the east. The short steep slope of land is to the west, the long and gentle slope to the east. Scotland turns its back on the Atlantic, and its largest river valleys and most navigable estuaries open to the North Sea and Europe. The Firth of Clyde is the only great river opening to the west.

Three physical divisions and natural regions are well marked —the Southern Uplands, the Central Lowlands, and the Highlands. The Southern Uplands are built of ancient granites,

slates, and other hard rocks. In the Central Lowlands the rocks are quite different from those of the Southern Uplands or the Highlands. It is, in fact, a sunken block of land which has slipped down between the mountain areas to the north and south. Such sunken areas are called rift valleys, and the boundaries of a rift valley are called fault lines. These fault lines are shown by black lines in fig. 48. The southern fault line runs from Girvan (Ayrshire) to Dunbar, and the northern from Helensburgh (Firth of Clyde) to Stone-

FIG. 48. Natural Regions of Scotland.

haven. This sinking of the land has formed the greatest lowland area in Scotland. Part of this is submerged and forms the Firth of Clyde on the west coast, and the Firths of Forth and Tay on the east, all valuable waterways. It contains the only coal-measures in Scotland, i. e. the most densely populated and richest parts of Scotland. Elsewhere, both in the uplands and highlands, the coal has been worn away by wind, water, and ice. The Highlands contain the oldest rocks, and form the most compact mountain area in our land.

FIG. 49. Main Railway Routes of Scotland.

The Southern Uplands.

The Southern Uplands. These resemble North Wales, not only in the nature of the rocks, but also in the trend of the rocks from south-west to north-east. They form a continuous belt of highland, cleft by river-valleys, and bordered by narrow coastal plains. A railway map shows that these valleys and plains determine the routes between England and Scotland, and that on them lie the chief towns. As in Wales, the uplands consist of moorlands, peat mosses, and sheep pastures. Sheep-rearing ('Cheviots') is the chief occupation. Roxburgh, Berwick, and Selkirk have more sheep per 1,000 acres than any other counties in Britain. In the old days, the 'men of the moss-hags' (that is, marsh and upland refuges) carried on a constant border warfare. Every man's house was a castle, well fortified against the attacks of Douglases, Elliots, and other families, whose deeds may be read in such ballads as *Chevy Chase*.

Routes between England and Scotland. The easiest route between England and Scotland follows the east coast from the old Border fortress of Berwick-on-Tweed, past Dunbar, where the Lammermuir Hills reach the sea, to Edinburgh. The Tweed rises near Hart Fell ('Annan, Tweed, and Clyde rise on one hill-side'), and drops 1,000 feet in the first thirty miles. Its hill-girt valley has long been a centre of considerable wealth and population, as is shown by the number of fine ruined abbeys, Melrose, Kelso, Jedburgh, &c., destroyed by the border wars. The water-power has given rise to numerous small manufacturing towns, e.g. Peebles on the Tweed, Galashiels on the Gala, Selkirk on the Ettrick, Hawick on the Teviot, making broadcloth ('tweeds') and hosiery.

In the west routes from Carlisle follow the valleys. Two reach Edinburgh, one by the valleys of the Liddel, Teviot, Tweed, and Gala, and the other goes up Annandale, over Beattock Summit, down the upper Clyde, and then west and north of the Pentlands. Another main line runs to Glasgow

by Dumfries, Nithsdale, and Kilmarnock. A coastal route passes by Dumfries ('tweeds') and sends branch lines to Kirkcudbright, Wigtown, and also to Port Patrick and Stranraer, ferry towns for the Irish ports of Donaghadee and Larne.

The Central Lowlands.

The Central Lowlands. Look at fig. 50. When the sinking took place, masses of molten rock reached the surface, forming volcanoes, or spreading out into great lava-flows. When these volcanoes ceased to be active, the lavas which filled their vents or pipes cooled and hardened. This happened so long ago that the ash-cones and the rocks below have been worn away, and the hard plugs of lava remain as high precipitous crags on which many ancient castles are built (e.g. Edinburgh and Stirling). The lava-flows also stand out as rounded hills (compare Cornwall). A belt of such heights runs across the lowland as the Renfrew Hills, the Campsie Fells, Ochil Hills, and the Sidlaw Hills. These hills are separated by the waterways of the Clyde, Forth, Tay, which have cut deep gaps through the volcanic barrier. On these gaps all the routes from north to south converge, and in them lie Glasgow, Stirling, and Perth, the three keys to the Highlands. Edinburgh, the fourth great lowland town, lies where the Pentland Hills narrow the east-coast route to England.

The modern history of these four historic towns, and the rise of newer industrial centres, turns on the distribution of the coalfields. There are three basins of coal: (1) the West or Ayr coal-field; (2) the Central or Lanarkshire coal-field, stretching from the Clyde across the upper part of the Forth estuary, through Lanark, Stirling, and Clackmannan; (3) the Eastern coal-fields on both sides of the Forth estuary, in Fife and Midlothian. All lie close to the sea, and contain the iron and limestone used in iron-smelting.

The Ayr Coal-field. On the Ayr coal-field the chief industrial centre is Kilmarnock, with foundries, engineering shops, and woollen factories. The coast towns, Ayr, Troon, &c., export coal and iron, especially to the ship-yards of Belfast.

The Central Coal-field, the Clyde Valley, and Glasgow. The Central coal-field has (1) immense deposits of coal and iron, (2) the splendid estuary of the Clyde, practically the only waterway on the west coast, and (3) easy communication by rail and by canal with the Forth. The Clyde rises in the

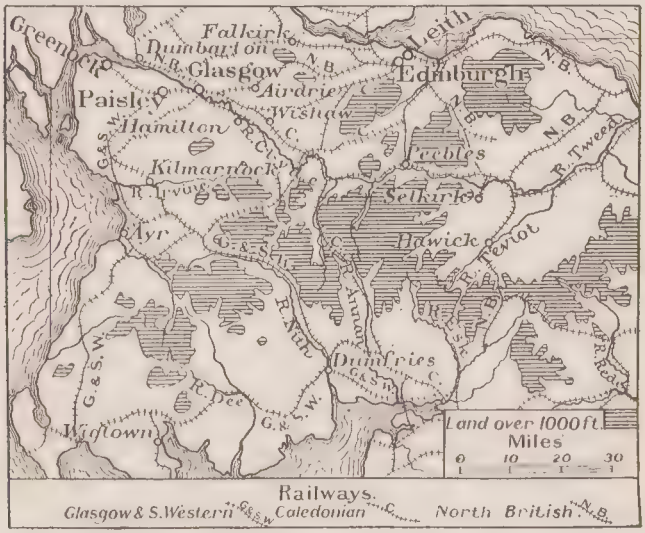


FIG. 50. The Lowlands of Scotland.

heart of the Southern Uplands, near Leadhills, a lead-mining centre and the highest village in Great Britain (1,400 feet). Flowing swiftly north-westward through narrow mountain alleys ('glens'), it drops over the falls of Clyde to the wider lowland valley ('strath'), at the head of which stands Lanark. Lanark thus commands the routes by the Clyde and Nith. The glens are sheep pasture. The straths permit the growth of richer cattle pasture, and of the hardier cereals. Hence Lanark has weaving, distilling, and leather industries. Below

Lanark the Clyde enters the coal-field. Numerous towns blacken the valley, Hamilton the mining centre, Motherwell, Coatbridge, and Airdrie with iron-furnaces, then Glasgow. Glasgow is by far the largest and wealthiest city in Scotland. A gap town, it has an ancient cathedral, university, and archbishopric. Note the many routes, one of which goes down the Clyde to Greenock, another through the Beith Gap by Paisley and Dalry to Ardrossan, while the third goes to Grangemouth on the Forth and connects Glasgow with the North Sea and Baltic ports. As a bridge town at the head of tidal navigation, and with the river deepened to accommodate ocean-going vessels, it has become a great port. Local coal, iron, and timber are brought to the wharves at a low cost. The Clyde is now one of the greatest ship-building areas in the world, Glasgow, Port Glasgow, Dumbarton, and Greenock being the chief towns thus engaged. Glasgow also works chemicals and textiles. Dumbarton uses the pure waters of Loch Lomond for bleaching. Other industries depend on the American trade. Paisley, with a suitable climate, has the largest cotton and linen thread factories in the kingdom ('Paisley shawls'). Greenock refines sugar. As the centre of a densely populated district, Glasgow rivals Liverpool and Manchester, and is surpassed only by London. Residential quarters lie, as usual, to the west, e.g. Helensburgh. Rothesay, Ardrossan, and other fishing villages of the west coast have become pleasure resorts. A canal connects the Clyde and the Forth. It is 35 miles long. In the east of the field, the historic town of Falkirk lies in the middle of a coal and iron district. Grangemouth and Alloa are coal ports.

Edinburgh and the Midlothian Coal-field. Edinburgh, the second town in Scotland in point of wealth and size, ranks first as the administrative, intellectual and ecclesiastical capital of Scotland. It arose first as a hill fort perched on the volcanic crag of the Castle Rock, commanding the narrow passages east and west between the Pentland Hills and the sea. Later it profited by the proximity of the port of Leith,

and of the Midlothian coal-field. Like most university towns it is a great printing centre, and has also famous breweries and distilleries. Both these industries depend upon a plentiful supply of water, which is brought by the mountain streams of the Leith and the Midlothian Esk, along which lie the paper mills. Edinburgh has also great cattle-markets, for the Lothian plains, with their drier climate, make good grazing and agricultural land.

The Midlothian coal-field supports iron and mining towns, and also contains valuable deposits of oil shale, from which oil and ammonia are extracted. Leith, which is continuous with Edinburgh, exports these products, and imports food-stuffs, and esparto grass for the paper-mills. The narrowest part of the estuary (Queensferry) has been spanned by the Forth Bridge, which is over a mile long. Here the docks of Rosyth serve as a naval base for the North Sea.

Fife and the Forth and Tay Valleys. The Fife Peninsula is isolated by the Ochil Hills, and Firths of Forth and Tay. Hilly in the centre, but with a rich coastal plain, it was called by a Scottish king 'a beggar's mantle with a fringe of gold'. Cupar, an inland town, is the capital. St. Andrews, an old ecclesiastical centre and university, is now a great golf and holiday resort. The Fife coal-field, of which the chief centres are Lochgelly and Cowdenbeath, supports such industrial towns as Dunfermline, an ancient Scottish capital, now engaged in linen manufacture, and Kirkcaldy, which makes linoleum. The flax for these Scottish linen factories is mostly grown in Russia. Methil and Burntisland export coal.

Stirling, between the Campsie Fells and Ochil Hills, owes its importance to the fact that its castle commands both the gap and the lowest bridge on the Forth. The river below the bridge is heavily laden with sediment and swings in great bends (meanders or 'links') over fertile alluvial meadows. Hence the rhyme 'One crook o' the Forth is worth an earldom in the North'. Stirling has tweed, tartan, and leather factories, and despite the Forth Bridge is still a great railway junction.

Perth is a similar bridge-town. It controls many routes, south to Edinburgh either by the Forth Bridge or by Stirling, west to Oban by Crieff, north to Inverness, either by

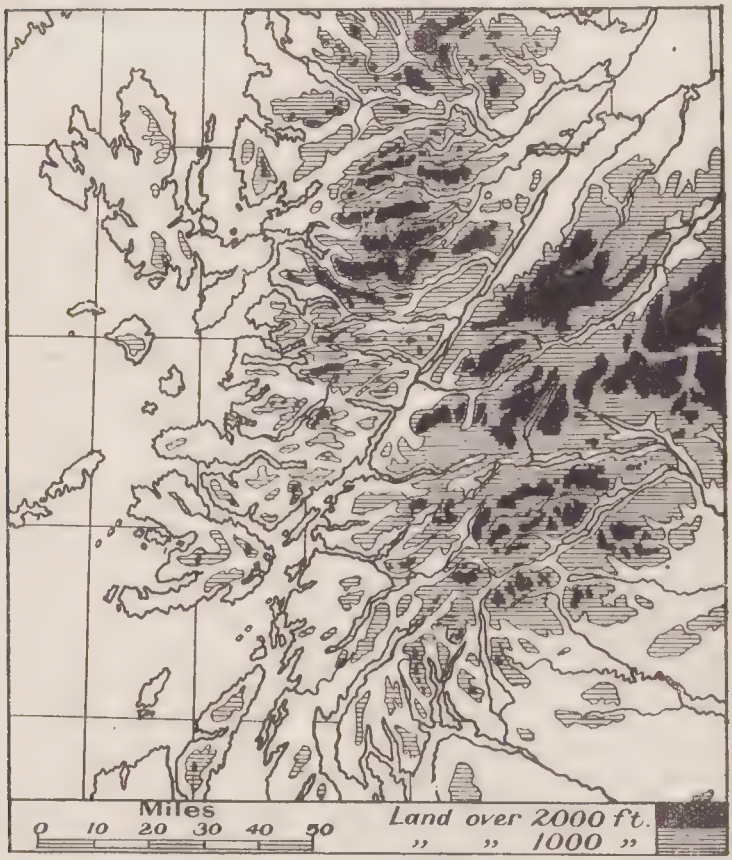


FIG. 51. The Western Highlands.

the Tay valley or by the east coast. It has great sheep markets, many textile and chemical industries, and large dye works. It was a favourite seat of Scottish kings, and not far away is Scone, the crowning-place of the Kings of Scotland.

North of Perth, the Tay and Isla drain Strathmore, the 'Great Vale', a rich belt of grazing-land lying between the Sidlaws and the Highland edge. Dundee and the fishing towns of Arbroath and Montrose manufacture hemp and flax into rope, sailcloth, and linen. About 1854, when the Crimean War cut off the Russian supply of hemp, Dundee manufacturers began to import jute fibre from India. Dundee is the centre of the jute manufactures, and produces bags, carpets, and fabrics of fine appearance but poor quality. Dundee manufactures marmalade and jam, and fruit farms have been encouraged in the Carse of Gowrie and on the Old Red Sandstone soils in the neighbourhood. It is also the head-quarters of the North Sea whaling and sealing fleets. The Tay Bridge enables the east-coast railway to take a short cut across the estuary. Stonehaven is a fishing town with brewing and woollen industries.

The Highlands and Islands.

The Highlands. Fig. 51 shows the great highland masses of northern Scotland, which are continuous except for the remarkable long, narrow valley of Glenmore, or the Great Glen, which runs from the Moray Firth south-west to the Firth of Lorne. This is a very narrow rift valley, a crack in the Earth's crust. Two long, deep lakes, Loch Ness and Loch Lochy, occupy about three-fifths of its floor. From Loch Ness the Ness River flows to the north-east, and from Loch Lochy the Lochy flows to the south-west. The whole area is a very ancient land, and shows the action of glaciers. There are no glaciers in Scotland now, for the climate has grown warmer since the days of the Ice Age, when Northern Europe was covered with a vast sheet of ice. It was this moving ice sheet which ground down the ancient mountains of Scotland, Northern England, and Wales, into flat-topped level plateaus, and ploughed long grooves and furrows, still to be seen in exposed rock surfaces; which scattered boulders

over the glens and moors; and which, as in the Scottish Highlands and the Lake District, scooped out long lakes, and barred the mountain torrents with many waterfalls. It also covered much of Great Britain and Ireland with boulder clay.

The mountain glens admit of little agriculture. Heavy rains carry away any loose soil, except where it is held back by copses of fir and birch, or banked back on the small stony holding of a Scotch crofter. Above the narrow glens are moorlands of purple heather and tawny bracken, broken by soft green patches of peat moss, blackened where the heather has been burnt for sheep pasture. It has been found that the highlands pay their owners better as deer forest and grouse moor than as sheep pasture. These preserves and the salmon streams fetch very high prices. These bare desolate moors are very thinly peopled. Few habitations can be seen except an occasional shepherd's or keeper's hut, or a shooting box. In old days the Gaelic Highlanders seldom married or settled outside their own valleys. Hence the passionate devotion of the clansmen to their chief (the head of the family), their hostility to other clans, and their raids. Raids are now replaced by peaceable emigration. The young people depart to Canada or New Zealand, where they thrive by the thrift and industry bred of their stony soils. The recent spread of game preserving has increased emigration.

The Eastern Highlands. In the Eastern Highlands, south-east of Glenmore, the higher western edge is marked by such heights as Ben More and Ben Nevis. Ben Nevis (4,400 feet high) is the highest mountain in the British Isles. Snow remains in the crannies of the north-eastern precipices all the year round. East from Ben Nevis the line of the Grampian plateaus is marked by the heights of Cairngorm (4,300 feet high) and Ben Macdhui. Railways use the Tay and Spey valleys south and north of these plateaus. One line from Perth enters the Highlands at Dunkeld and runs through the Killiecrankie defile to Blair Atholl, where it crosses

by Dalnaspidal (Drumochter Pass) to the Upper Spey and Inverness. Another route runs from Glasgow by Loch Long and Loch Lomond to Fort William. The only east-west routes run from Perth (via Crieff) and Stirling (via Callander), unite near Ben More, and continue to Oban.

South of Loch Linnhe the long Mull of Kintyre stretches out towards Ireland with Arran to the east, and to the west Jura, with two conical hills and the low-lying boggy Islay. Kintyre has numerous small lowland farms, raising cattle and the hardier cereals, oats and barley. Campbeltown, in the south, and Islay have distilleries. The Crinan Canal has been cut across the neck of the peninsula. Fisheries are important, especially the herring and haddock fisheries of Loch Fyne. The magnificent scenery attracts thousands of tourists to Inverary, at the head of Loch Fyne, and Oban. One of the finest tours is by coach from Callander through the Trossachs to Loch Katrine, which is crossed by steamer, and by coach again to Loch Lomond.

The drier east coast is good farming land. The chief town is Aberdeen, between the estuaries of the Dee and the Don. It exports, and is built of, grey granite, against which the scarlet gowns of the undergraduates (it is one of the four Scottish universities) make a fine contrast. It has many industries, imports Irish cattle to be fattened on the adjacent farms, and together with Peterhead and Fraserburgh is an important fishing and fish-curing town. The royal residence of Balmoral, and the historic seat of Braemar, lie in the highland valley of the Dee. Banff, Elgin, and Nairn are county and market towns on the rivers flowing to the northern coast, where there are numerous fishing villages. This plain is also crossed by the Spey, the long valley of which has separated Monadhliath Mountains from the Grampians.

Inverness is the natural capital of the Highlands, controlling the East Coast, Highland, and Glenmore routes. Glenmore is now used by the Caledonian Canal, which allows vessels of considerable tonnage to pass from east to west without

facing the dangerous passage of the Pentland Firth. Fort George in the north, Fort Augustus in the centre, and Fort William at the foot of Ben Nevis were built by our Hanoverian kings against the Jacobite clans of the north. Fort William is the most important. Modern science has already begun to utilize the abundant water-power of the highlands. The Falls of Foyers, west of Loch Ness, and water-power at Kinlochleven, generate electricity, which is used to extract aluminium from local and Irish clays.

The Northern Highlands, like the Grampians, are wide desolate grouse moors and deer forests, trenched with deep lochs and salmon rivers. The only considerable lowlands and towns lie round the Cromarty and Dornoch Firths, and in the eastern corner of Caithness. Dingwall, Cromarty, and Dornoch are small market towns. Invergordon is growing in importance with the use of the Cromarty Firth as a naval base. Wick is very important for its herring fisheries. The lowland on which these towns are built consists of horizontal layers of red sandstone. Wick exports great slabs of this for paving purposes. The Pentland Firth, between the Orkneys and the mainland, is extremely stormy and dangerous. The tides race through this narrow channel between the Atlantic Ocean and the North Sea at a rate of six to ten miles an hour, forming dangerous eddies and whirlpools.

The Orkneys and Shetlands rely largely on the herring and whale fisheries. The fleets sail from their respective capitals, Kirkwall and Lerwick. The small, hardy, rough-coated Shetland ponies and sheep graze on the wind-swept pastures. The cottage industries (knitted garments and homespuns) are a considerable source of profit.

The West Coast and the Hebrides. The west coast has a very wet climate. Everywhere the mainland is penetrated by long winding valleys shut in between mountain walls on either side. The unsubmerged parts of these valleys contain long glacial lakes, such as Loch Morar and Loch Maree. These are often of great beauty. There are a few small

villages perched on the ledges and narrow deltas of the fiords. Their inhabitants are half farmers and half fishermen. The poverty of the land drives them to emigrate. In old days, being unable to raid by land, they developed like the Vikings of Norway into skilful and daring pirates. Communication inland is very difficult, and only three railways reach the west coast. One, as we have seen, runs to Oban, another goes from Fort William via Loch Eil to Mallaig, and the third is from Dingwall on the east coast line via Loch Carron to the Kyle of Lochalsh. From Mallaig at the southern, and Lochalsh at the northern end of the Sound of Sleat, steamers run to Skye. The inner Hebrides, Skye, Rum, Eigg, and Mull, with the long peninsula of Ardnamurchan, the westernmost point in Great Britain, are volcanic. The rugged Coolin hills of Skye, with their deep corries or niches in the slopes of the hills, often contain picturesque tarns, and their deep glens, strewn with boulders, through which rush torrents fed by the heavy rains, form one of our most beautiful mountain districts. Portree is a tourist centre. Here, as in the north of Ireland, are wonderful amphitheatres of columnar basalt. The pillars of Fingal's Cave, in the small island of Staffa, off Mull, are of the same formation. Iona, south of Staffa, still has remains of the first Christian missionaries, St. Columba and his followers, who came from Ireland.

The Outer Hebrides are separated from the Inner Hebrides by the wide Minch. On the map they look rather like a kite, the head of which is the island of Lewis-with-Harris, and the tail a string of islands of which North and South Uist are largest. The bare rounded hills are plastered with boulder clay, and in the hollows and rock basins are innumerable lakelets. The soil is infertile and often boggy. A few cattle and sheep are kept. Only the hardier cereals, oats and barley, will grow. Homespuns are woven on hand-looms in the cottages, and whisky is distilled in a primitive way. Peat is the only fuel, and both the Harris tweeds and whisky smell of it. Fishing is the chief occupation and centres at Stornoway,

the only considerable town. Still wilder and lonelier is the tiny island of St. Kilda, fifty miles west of Harris. The inhabitants live mainly on the fisheries and the myriads of seafowl that breed on the steep cliffs.

Population. The map in fig. 18 shows how little of Scotland is well peopled. Most of that small population is concentrated into the central belt of the central lowlands and the eastern coastal plains. Edinburgh, with its easy communications by land and sea, is consequently a very well placed capital. Hardly any important town except Aberdeen, Inverness, Oban, Greenock, Ayr, and Dumfries, is more than 50 miles distant, and the last three are only just over 60 miles away. This concentration of the population does much to give Scotland its well-marked national unity.

Islands in British Waters.

Man (230 square miles), in the Irish Sea, almost equidistant from England, Scotland, and Ireland, is a mountainous island, rich in minerals, especially lead. It possesses its own Parliament, the House of Keys, which sits in Douglas, on the east coast, the largest town. The picturesqueness of the island attracts thousands of tourists, chiefly from Lancashire.

The Channel Islands in the English Channel, 80 miles from England and 10 from France, are the remnants of England's French possessions, and still use a French dialect. The islands have self-government. Orchards are numerous, and fruit and early vegetables, especially potatoes, are grown for the English market. Cattle are bred in large numbers. The largest islands are Jersey (45 square miles), capital St. Helier; Guernsey (25 square miles), capital St. Peter Port; and Alderney (4 square miles).

Map Measurements.

It is well to know how to measure maps and find out scales and distances and areas from them. In fig. 1 measure the distance from Cape Wrath, the north-western point, to the Lizard, the southern point of Great Britain. It is $2\frac{7}{8}$ inches. The distance between the two is known to be 600 miles. One inch on the map, therefore, represents 210 miles of land, or, as there are 63,360 inches in a mile, 13,300,000 inches. That is to say, this map is 1 : 13,300,000 of the real length and breadth of the part of the globe it represents. To make a scale to measure by, draw a straight line and from one end measure off say six lengths each equal to 0·475 inch. Each of these represents 100 miles. Divide the left-hand one of these lengths into tenths, each of which represents 10 miles. Compare the scale with that in fig. 1; where however the part to the left of the 0 is divided only into two fifty-mile parts, and that to the right shows only one division of 100 miles.[1]

Using this scale, measure the distance across the English Channel at its western end (about 100 miles), across the Strait of Dover (about 20 miles), across the North Sea from the mouth of the Humber to Jutland (about 400 miles), and from the nearest point of Great Britain to Scandinavia (about 300 miles). On this map (or on a larger map in the atlas), measure the greatest and least breadth of Great Britain and of Ireland, the length of Ireland, and the distances across the Irish Sea and the St. George's and North Channels between Ireland and Great Britain.

To measure areas is more difficult. Get some transparent paper and trace the outline of Ireland in fig. 30 on it. Now put this tracing over paper ruled in little squares each with sides of one-tenth of an inch. Count the number of these little squares covered by the outline of Ireland. There are about 256. The scale shows that a side of each square represents 11 miles. Each little square, therefore, represents an area of 11×11 or 121 square miles. Hence the area of Ireland is 256×121 or in round figures 31,000 square miles. Measuring the area of Great Britain it will be found to be about 83,000 square miles. The total area of Great Britain and the smaller islands belonging to it is 88,000 square miles, and of Ireland with its islands 33,000 square miles—total for Britain of 121,000 square miles.

[1] On maps which show parallels of latitude the true distance between two parallels, find out the difference between them in degrees and multiply by 69·2, which is the average number of miles in a degree of latitude. Then measure the distance between the parallels on the map in inches and proceed as above.

EUROPE

Position. The most northerly point, North Cape, is distant nearly 20° from the pole; the southerly point, Cape Tarifa, is over 35° from the equator. From north to south, therefore,

FIG. 52. Europe—its Peninsulas, Islands, and Seas.

Europe covers little more than one-third of the distance between pole and equator, and lies almost wholly in temperate latitudes. The most westerly extension of the mainland reaches nearly to 10° W., while the eastern boundary roughly coincides with 60° E.

Seas, Gulfs, Peninsulas, and Islands. Look at fig. 52. Notice how the mainland is cut up into peninsulas by the sea, which penetrates deeply into the northern half of the continent as the North Sea, and the Baltic Sea, with its gulfs. These we may call the Northland Seas. Still more deeply cut is the Mediterranean Sea in the south, connected

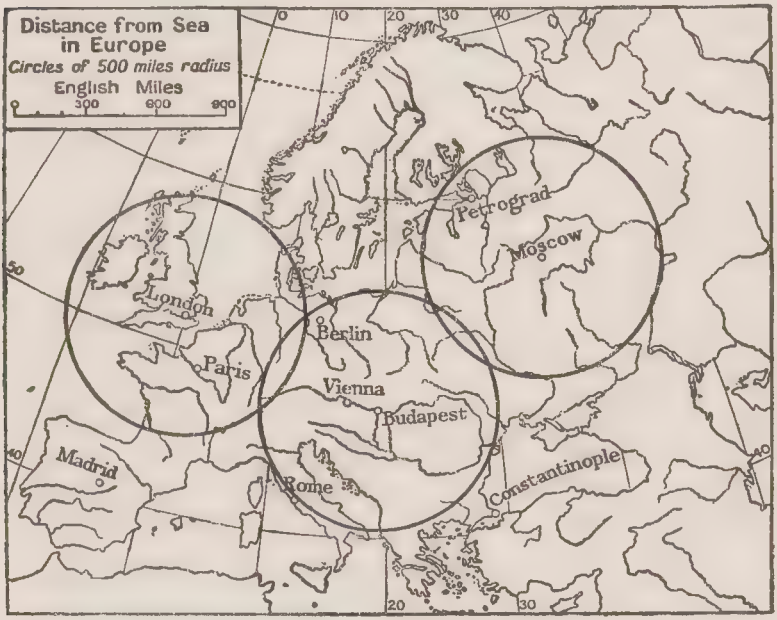


FIG. 53. Distance from the Sea in Europe.
The circles are drawn with Moscow, Budapest, and London as centres, and have a radius 500 miles long.

through the Strait of Gibraltar with the Atlantic Ocean. It widens out into northward-running gulfs, which cut the southern half of Europe into three great peninsulas. Connected with the Mediterranean on the east by the Dardanelles is the small Sea of Marmora, leading by the Bosporus into the vast Black Sea, which opens by the Strait of Kerch into

FIG. 54. Physical Features of Europe.

the small Sea of Azov. All these may be regarded as together forming a Midland Sea. The land-locked Caspian Sea, still farther east, is not connected with the Midland Sea.

The result of this penetration of land by sea is to bring all parts of Europe within a short distance of the sea (see fig. 53), and to give Europe, and particularly the peninsular countries, a very great extent of coastline, and many excellent harbours. The inhabitants readily become skilful fishers, sailors, and traders by sea. They are, in consequence,

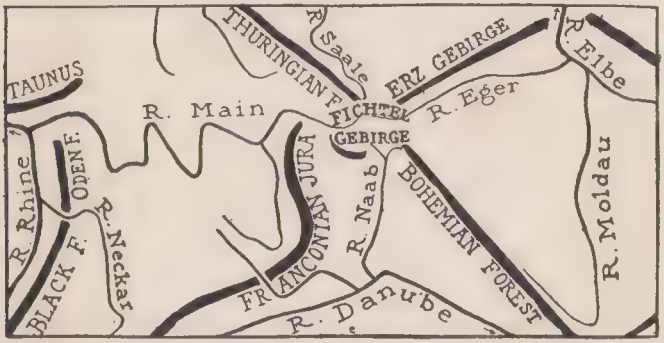


FIG. 55. Relation of the Fichtel Gebirge (Fir Mountains) to the highlands and rivers of Central Europe. This is a very important centre from which highlands and rivers radiate in four directions.

keen explorers, and good colonists, and they, and their descendants in other continents, lead the world in all seafaring occupations.

Relief. Look at the relief map, fig. 54, which shows several different levels of land:

1. The shallow seas under 600 feet deep, covering the continental shelf, and the deep seas over this depth;
2. The lowlands, between sea-level and 600 feet elevation;
3. The uplands between 600 and 1,500 feet;
4. The mountainous lands over 1,500 feet.

Observe that the deep seas form three basins (Figs. 52 and 54):

1. The Arctic Ocean with its southern gulf, the Norwegian Sea, separated by a submarine ridge stretching from the British Isles through the Faeroe Islands and Iceland to Greenland, from

2. The main basin of the Atlantic;

3. The basins of the Mediterranean, divided from each other by submarine ridges.

Notice that the inner seas of Europe fall into two groups—the shallow Northland and the deep Midland Seas. The shallow seas make exceptionally rich fishing grounds, visited by fishing fleets from the numerous excellent harbours of the surrounding shores. The tides of the Atlantic are strongly felt in the shallow seas of the west, causing a great rise and fall in the estuaries which open to them, and carrying the shipping up and down with the tide. The Baltic is almost landlocked, and the tides are scarcely felt. The rivers consequently form deltas instead of estuaries, and numerous lagoons border the sea. The deep Midland Seas are also tideless. Deltas and lagoons are formed as in the Baltic. The seas are less rich in fish than the shallow seas.

The shallow seas border the lowlands, of which they are the submerged portions. Lowlands and shallow seas together form a continuous band stretching across Europe from east to west; broad, but for the most part submerged, in Western Europe; narrowed to a little more than a quarter of the breadth in Central Europe; and widening out in the east to form the compact mass of Eastern Europe, stretching from the White Sea in the north, to the Black and Caspian Seas in the south.

The lowlands may be grouped as:

1. The Plain of the Low countries.

2. The German Lowland.

3. The Plain of Russia.

The lowlands are bordered by the uplands, highlands and mountains of Europe.

From fig. 54 and an atlas map with names it will be seen that the highlands form three groups:

1. The Ural Mountains in the east.

2. The Highlands of Britain and Scandinavia, or the North-west Highlands, in the north-west.

3. The Central and Southern Mountains and Highlands which form the bulk of Central Europe and of the Mediterranean peninsulas and islands in the south. These may be grouped into:

(*a*) The Central Highlands.

(*b*) The Alps and Carpathians, each curving round to enclose a lowland, the former that of Lombardy, the latter that of the middle Danube.

(*c*) The mountains of the southern peninsulas and islands.

The Plain of the Low Countries consists of deltas and marshes. It lies so low that it is continually in danger of flood from sea and river, to prevent which dykes have been built to keep out the sea, and to confine the streams of the deltas to their channels. Where the coast is sandy the sand hills, or dunes, are planted with coarse grasses, whose long creeping roots mat the light sands together, and enable them to resist wind and water.

The North German Lowland consists of two belts, a low hilly land bordering the sea, known as the Baltic Heights, and a plain to the south. This hilly land, which is separated from the sea by a narrow belt of low sandy shore and lagoons, consists of low wooded hills, interspersed with thousands of lakes. It slopes gently southward to the flat plain of central Germany. In the plain the landscape consists of heathy moors and pine forests, varied by rich green meadows and cultivated fields. The rivers creep sluggishly across the plain, often flooding the low surrounding country, and on approaching the sea form deltas.

The Russian Plain lies mainly between 300–600 feet above sea-level, rising gradually from west to east. It rarely exceeds

1,000 feet in elevation. The differences which it shows in different parts are due to the influence of climate and soil on its vegetation, the forest giving place in the south to rolling grass and wheat lands. As this plain contains nearly half the area of Europe the rivers which crawl across it are the longest in the continent.

The Russian plain rises in the east to the wooded Ural Mountains, which form the eastern limit of Europe.

The Plateau of the North-west Highlands forms the bulk of the Scandinavian peninsula, and is continued in the highlands of Britain. In Scotland it rises, as we have seen, to the height of over 4,000 feet, and it reaches twice this elevation in Scandinavia. In Scandinavia the plateau rises steeply from the sea on the west, and descends first abruptly and then gradually to the sea on the east, so that Norway in the west is almost wholly a mountainous country, while Sweden in the east is undulating. The west coast is a fiord coast, like the west coast of Scotland, but in Scandinavia the fiords penetrate far more deeply into the land, and their mountain walls are far higher and more precipitous. The lower parts of the plateau are covered with pine forests, but the high plateau, or fjeld, consists of heaths and bogs, with mountains of uniform height occasionally rising above the general level.

The Central Highlands consist of a number of separate masses of hills, rising to from 3,000 to 5,000 feet above the sea, usually with rounded summits, and densely wooded almost from top to bottom. The lower slopes are cleared for cultivation, or for pasture lands. The intervening plains are richly cultivated.

The Alps are from two to three times as high as the Central Highlands. They consist of parallel ranges, separated by deep steep-sided valleys, some of which contain long narrow lakes where they open to the plain. Many of the peaks rise above the line of perpetual snow, which accumulates to so great a depth in the valleys between that it is

changed into solid ice by its own pressure. These accumulations of ice creep in long tongues, or glaciers, down the valleys, melting at last into rushing torrents. Below the snow line, but still too high for trees, are the alps, or mountain pastures. Lower still the sides of the valleys are clothed with forests, first of dark evergreens, and lower of deciduous trees. The valleys widen out, and at lower levels their floors and sides are cultivated.

In the eastern Alps are limestone ranges, too precipitous for snow to lie on, with bare rock peaks, which are often of fantastic shape.

A few great valleys lead far into the heart of the Alps. At certain points it is possible to pass from the head of one valley directly to the head of another, over a col or mountain pass, a sort of depression between the peaks which enclose the valleys. Without these valleys, and the passes to which they lead, the Alps would be impassable.

The Carpathians continue the curve of the Alps, but reach to little more than half the height of the highest Alpine peaks. They are rounded ridges except on the north, where rocky peaks rise to 8,700 feet. Except on the highest slopes, which are grass-covered, they are thickly forested.

The Iberian peninsula in the west, and the Balkan peninsula in the east, are both broad, with a high plateau in the centre. The central, or Italian peninsula, is long and narrow, with a backbone of mountains. Active volcanoes are found in the south-west. The highlands of these peninsulas are all forested in the north, but bare in the centre and south.

Rivers. The rivers of the North-west Highlands are short and unimportant on the steep north-western slope; longer, but still rapid, on the longer eastern slope, over which they flow to the Baltic.

The short slope of the Russian plain is also to the north-west, but as it is very gentle the rivers draining to the Baltic and White Seas are long and very sluggish. They are divided from the rivers flowing down the long slope to the

Black and Caspian Seas by a line of higher ground, which runs from the Carpathians north-east to the centre of the Urals. The Volga, the longest river in Europe, flowing to the Caspian, and the Dnieper, flowing to the Black Sea, are the most important. All the rivers are slow, and navigable almost to their source. They are frozen in winter, as are those flowing to the Baltic and White Seas.

The rivers flowing from the Central Highlands are swift in

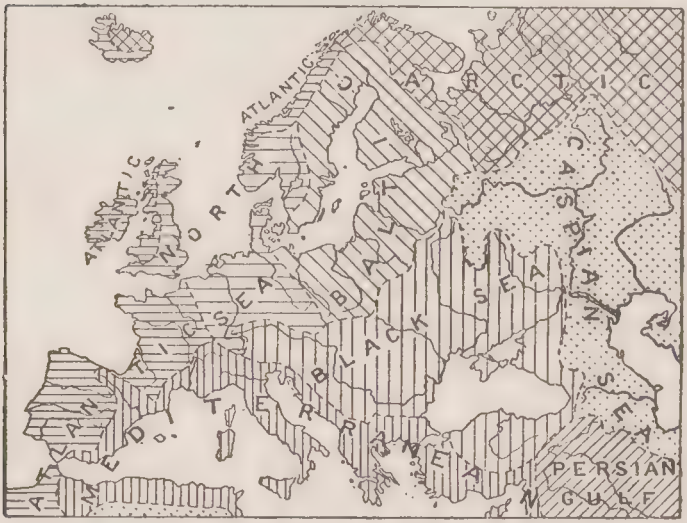


FIG. 56. Chief Drainage Areas and Divides.

their upper courses, but become slow enough for navigation as they cross the plain. The Vistula, the Elbe, the Rhine, the Seine, and the Loire are the most important. The Rhine is exceptional as being the only river which crosses the entire breadth of the highlands of Central Europe, connecting them with the Alpine region in the heart of which it rises. Two rivers drain the outer, or convex margin of the Alps, the Saône-Rhone on the west, flowing to the Mediterranean, and the Danube on the north, flowing to the Black Sea. The

inner, or concave margin is drained by the Po, which has formed a low-lying plain between the Alps and the mountains of the Italian peninsula. Most of the rivers of the southern peninsulas have their courses mainly in the highlands, and are navigable only near their mouths, where they enter the lowlands.

The valleys of some of these rivers form important routes, followed from ancient times by roads, and at the present day by railways. The Seine, with the Saône-Rhone valley, and the Rhine with the tributaries of the Po, form through routes from north to south. The Danube is the great natural route from west to east, connecting Central Europe with the Balkan peninsula and the countries round the Black Sea.

The areas drained to the different seas are shown on fig. 56.

Climate. Look at the map in fig. 57. It shows the regions of Europe having long periods of frost. Notice that nearly all Scandinavia and Central Europe have more than two months' continuous frost in winter. The greater part of the Russian plain has over four months' frost. Notice too that all the western coasts and the Mediterranean have no long continued frosts, though occasional frosts occur. The period of frost in the Baltic is shorter than on the surrounding lands. All this is what we should expect from our study of the climate maps of the British Isles. The warmest winter regions of Europe, as in the British Isles, are those near the sea, and for the same reason. The sea is warmer than the land in winter, or, rather, it cools less quickly, and it warms the air which passes over it towards the land. The severity of the winter in Europe increases, not exactly from south to north, though the winters of Northern Europe are much colder than the winters of Southern Europe, but much more from west to east, where the land widens out and the interior is farthest distant from the sea. Over a great part of Europe the winter is much milder than it would have been if the continent had been more compact.

The same map shows where the summers are longest and

hottest. In the Thames valley, the warmest part of the British Isles, the temperature in the heat of summer does not average over 64° F., and when for a few days it averages over 70° F. we feel the heat very oppressive. The map shows that the Midland Seas and their surrounding lands have an average temperature of over 70° F. every day for over two months of the year, while in the extreme south this average is

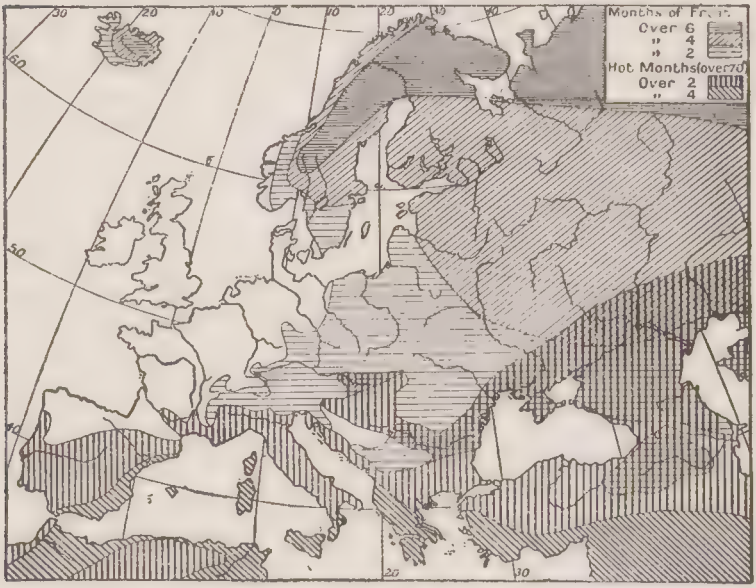


FIG. 57. Temperature Map of Europe, showing the Duration of Frosty and Hot Weather. The cross-rulings show the regions with greatest ranges of temperature.

maintained for four months. Notice particularly that in the south-east of Russia it becomes hotter in summer as we go in a north-easterly direction, that is to say, away from the sea. This, again, entirely agrees with our observations in the British Isles. The influence of the sea is to make the climate of the neighbouring lands uniform, or equable, by keeping down the heat in summer, and, in a still more marked degree, by

keeping down the cold in winter. The lands of the west, no part of which is very far from the sea, have no extremes of heat or cold, while in the Russian plain, farthest from the sea, places in the latitude of the English Channel have four months' steady frost, and over two months' intense heat. But for the cutting up of Europe by the Northland and Midland Seas a great part of the continent would have a much hotter

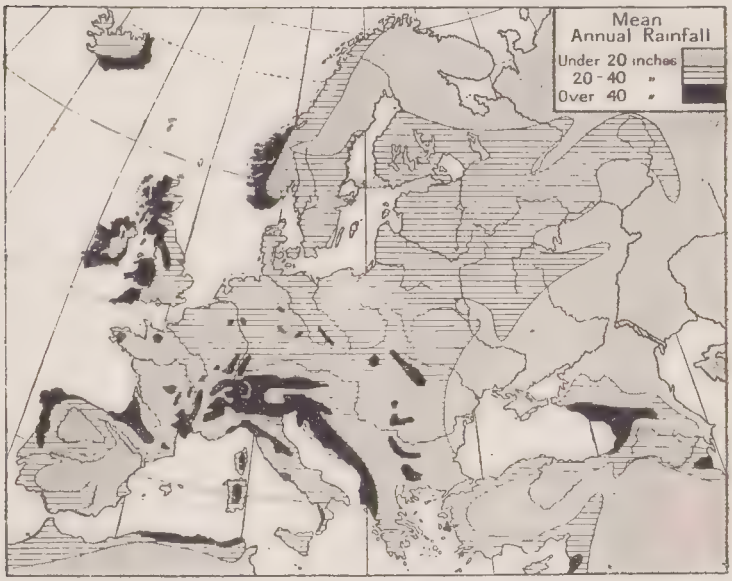


FIG. 58. Mean Annual Rainfall of Europe. The dotted parts have under 20 inches, the ruled parts from 20 to 40 inches, and the black parts over 40 inches of rain.

summer and a much colder winter, that is a much more extreme climate. That this is not the case is, perhaps, the greatest of all the advantages which result from the distribution of land and sea already described.

Climate, as we know, is affected, not by temperature only but by moisture. Look at fig. 58, where the map shows the rainfall in any year in different parts of Europe. If we

compare it with the relief map in fig. 54 it will be seen that the rainiest regions are highlands, and that the plains are, on the whole, much drier. This was also true for the British Isles. Now compare the rainfall of east and west, either in the lowlands or in the Scandinavian or the Iberian peninsula. As in Britain there is a great contrast between the wet west and the dry east. To explain it we look at the wind arrows in figs. 16, 17, which show that the prevailing winds are west or south-westerly. That is to say, they come over the sea, bringing rain to the west coasts.

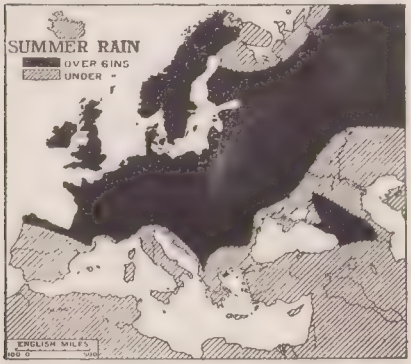


FIG. 59. Regions of Europe receiving more or less than 6 inches of rainfall during the summer three months.

Fig. 58 shows only the total quantity of rain which falls in the year, but in different parts of Europe, owing to the great extent of the continent, rain falls at very different times. Look at fig. 59, which shows the rainfall in the summer three months, June, July, and August. The rainfall is fairly equal all over Northern Europe, but greatest in the highlands, and very small round the Mediterranean, where hardly any rain falls. The air over the land becomes heated in summer and rises to the colder regions of the upper air,

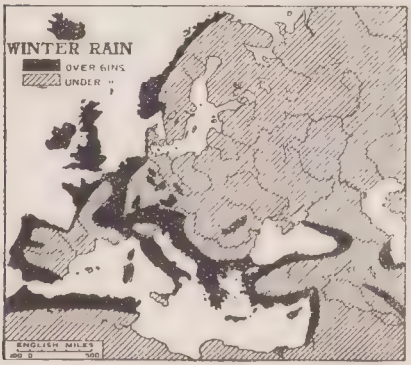


FIG. 60. Regions of Europe receiving more or less than 6 inches of rainfall during the winter three months.

where it is chilled and the moisture it contains condensed into rain. The prevailing winds are still from the Atlantic. Over the Mediterranean the wind is blowing from the north-east, i.e. from cooler to warmer regions, so that the air is not cooled, and there is little or no rainfall.

Now look at fig. 60, which shows the rainfall in the three winter months, December to February. Notice that all the east of Europe is very dry, and that it is only along the very margin of the western Mediterranean coasts and in the Alpine region that rain falls abundantly. The prevailing winds come from the south-west, that is, from warmer latitudes and over the sea, which we have already seen is warmer in winter than the land. On reaching the land, therefore, the air is cooled, and parts with its moisture as rain or snow, so that it is comparatively dry before it reaches the interior of Central and Eastern Europe.

We can now divide Europe into the following three climatic regions:—

1. The West, with equable temperature and rain at all seasons;

2. The East, with extremes of temperature and summer rains;

3. The Mediterranean, with hot dry summers and mild winters, and receiving the greater part of its rainfall during the winter six months.

Vegetation. Look at fig. 61, which shows the natural vegetation of Europe. It shows six different vegetation regions:

1. The tundra, or lands of the extreme north, which are too cold for the growth of trees, indicated by cross rulings.

2. The wooded or forest regions.

(*a*) The coniferous, or cone-bearing, needle-leaved, evergreen pine and fir woods of the north, represented by vertical ruling;

(*b*) The deciduous trees, which shed their leaves every

autumn, covering the lower part of Central Europe, represented by slanting ruling;

(*c*) The evergreen forests of the Mediterranean basin, represented by horizontal rulings.

3. The steppe, or grass lands of the south-east, indicated by dots.

4. The mountain regions, too high for trees, shown in solid black.

The Tundra, in the extreme north, is perpetually frozen

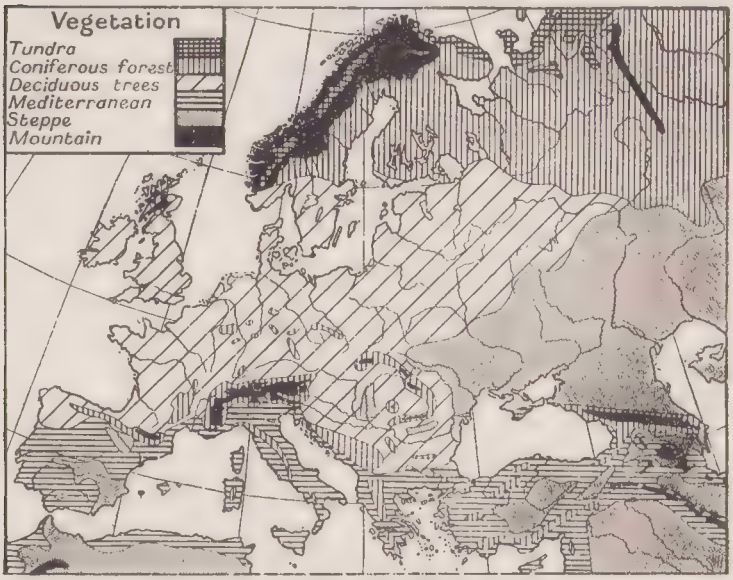


FIG. 61. Vegetation Map of Europe.

except for a month or two in the short summer, when it thaws to the depth of a foot or two. Water cannot penetrate this frozen soil, and the whole tundra tends to be marshy or water-logged in summer. Towards the pole vegetation disappears, but over the greater part there is a poor growth of moss, lichens, &c. Low berry-bearing bushes, such as crowberries and cranberries, appear further south, and dwarf trees,

a few inches or a foot or two in height, grow in sheltered spots, becoming larger and more numerous towards the forest edge.

The tundra offers nothing to its few inhabitants except the reindeer moss on which the reindeer feeds, and the berries which ripen in autumn. The reindeer alone makes human life possible. It provides a means of moving over the tundra, and supplies milk for food, and skins for clothing and other uses. The life led on the tundra is poverty-stricken even in summer, and in winter a move is made south to the forest edge.

The Coniferous Forests of the Scandinavian peninsula and the north of Eastern Europe consist of tall, straight firs and pines, beneath whose shade we find none of that undergrowth of flowers and grass which makes our own deciduous woods so lovely. Their tall straight stems make masts for ships, or are sawn into planks to build their keels and decks. The houses in the forest area are generally of wood, often beautifully carved and painted. Wood is used instead of coal for fuel, and is even burned in furnaces to smelt metals or, in some parts of the forest country, to drive the trains and steamboats. The trees are felled in winter and dragged over the frozen ground to the rivers, down which they float when the frost breaks up in the spring. On these forest rivers sawmills are often built where rapids or waterfalls make the current strong enough to turn water-wheels, and there much timber is sawn. In recent years the growth of trade has led to many new uses for wood. The best timber is made up into such articles as door-frames and window-sashes which are sent to other countries in a finished state. Wooden matches are made in large quantities, while timber of short length or inferior quality is made into pulp out of which paper is made.

Coniferous forests are also found on the highlands of Central Europe, where timber is put to much the same uses. On the Rhine, the Elbe, and particularly the Vistula, great rafts of

timber are floated down, steered by a small crew who live in wooden cabins built on the raft.

The Deciduous Forests of the Central European Lowlands are chiefly made up of oak, elm, beech, and further south chestnut. The girth of the trees is much greater, and their branching more irregular, so that they are unsuitable for masts. Their harder timber is used where durability is a consideration.

The Evergreen Forests of the south are unlike either of the preceding. Pines occur, but of a bushier shape, unlike the tall spires of the northern forests. The silver-grey olive groves, the forests of cork and other evergreen oaks, are the principal remains of the evergreen forests which once covered Southern Europe. These have been ruthlessly cleared throughout the Mediterranean lands to the great injury of the country. The roots of trees protect and bind together the soil and prevent rains and streams from carrying it away. Much of Southern Europe has been changed from a fertile, if rather dry, land to barren rocky hill-sides, in whose scanty soil only dry thorny plants manage to exist.

The Steppe, or treeless grass land, occupies the drier regions of the south of Eastern Europe, where the winter is severe, the summer hot, and the rainfall light. These conditions are not favourable for slow-growing plants, and as the soil is extremely light and loose trees do not root firmly. The plants which do best are those which come to perfection in a single year. As we see in our hay-meadows, grasses of various kinds grow very rapidly, and flower and seed in a few weeks. In the steppe grasses find exactly the conditions which suit them. The soil which has been frozen in winter thaws in spring, supplying moisture to their roots, while the sun grows stronger and hotter daily. In the spring the steppe is beautiful with expanses of many-coloured tulips, lilies, and other bulbous plants.

The steppe, in its natural condition, is fitted only for the rearing of grass-eating animals, particularly horses and sheep.

It offers no stone or timber for building or fuel, and the people of the steppe were, and in some cases still are, dwellers in tents, made either of the skins of animals or of their wool pressed into felt. Such trades as carpet-making, leather-working, and saddlery, utilize wool and skins in other ways. Towards the south-east, where the steppe is drier and hotter, the grass becomes poorer, and the country passes into a semi-desert condition.

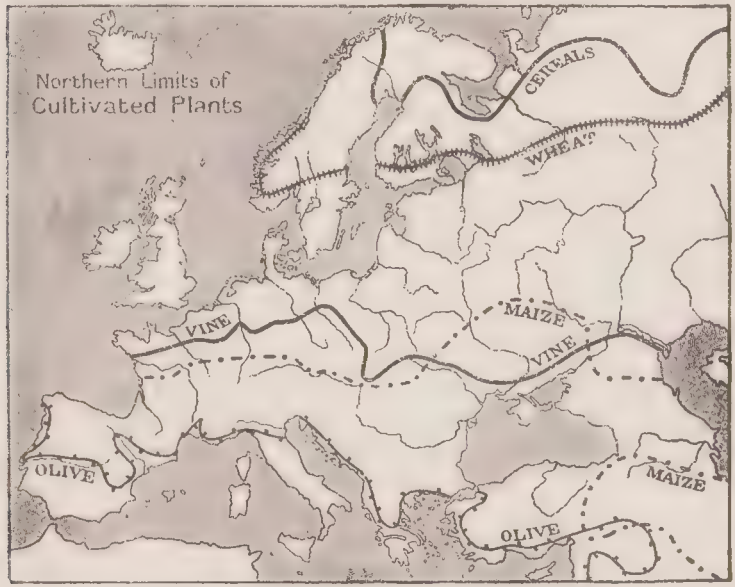


FIG. 62. Northern limit of some cultivated Plants.

Such are the natural vegetation zones of Europe, but many changes have been made by man. Only the tundra now remains in its natural condition. The evergreen forests of the Mediterranean, and the deciduous forests of Central Europe, which covered the regions best suited for agriculture, have almost disappeared. Much more remains of the coniferous forest, for this is found either in colder parts of Europe or on the higher mountain slopes, neither of which are well suited for agriculture. Even the steppe has, within the last

century, been brought under the plough, and large tracts have been turned into agricultural land.

Look at the map of the cultivated plants in fig. 62. The most important are the cereals, wheat, barley, rye, and oats. Wheat, which, as we saw, needs warm and relatively dry summers, is grown throughout the Mediterranean lands and the deciduous belt, except where it is too high and cold or exceptionally wet or dry. It ripens excellently in the hot summers of the steppe, which is becoming a great wheat-growing land. Rye and oats are grown throughout Central and Eastern Europe on the poorer lands and in the higher districts. Barley is grown wherever agriculture is possible. Root crops are most important in the deciduous belt. The potato is universally grown, except in the coldest and driest parts of the continent. The turnip is also widely distributed. The sugar-beet is extensively cultivated in the central lowlands. The pulses, especially peas and beans, are largely grown in the Mediterranean and the deciduous belt. Lucerne is grown for fodder in the south, and clover further north. The fibre plants, flax and hemp, are chiefly cultivated in the lowlands of Central Europe and in the west of the Russian plain. (See figs. 69–71.)

Of fruits the grape vine and the olive, both Mediterranean plants, are the most important. Other Mediterranean fruits are the orange, lemon, fig, mulberry, pomegranate, and peach. The vine extends northwards, along the terraced southern slopes of the hills, far into Central Europe. As we go north the walnut, pear, plum, cherry, and particularly the apple, become more important. In the northern forest clearings fruits ripen only in good years, though the small fruits, strawberry, raspberry, &c., are still excellent.

Animals. As man has dealt with the vegetation of Europe, so has he with its animal world. The wild animals, like the forests, have disappeared before his advancing plough, though a few still survive in the lonely forests and on the higher mountain slopes. Some wild animals remain because

they are protected during their breeding season, in order that they may be hunted at other times. Chamois in the higher mountains of Central Europe, wolves in the forests of Eastern Europe, the brown bear and lynx in the coniferous forests of the north, the wild boar in Central Europe, the fox and deer in this country, such small wild animals as the hare, rabbit, squirrel, &c., and some small fur-bearing animals in the northern coniferous forests, are

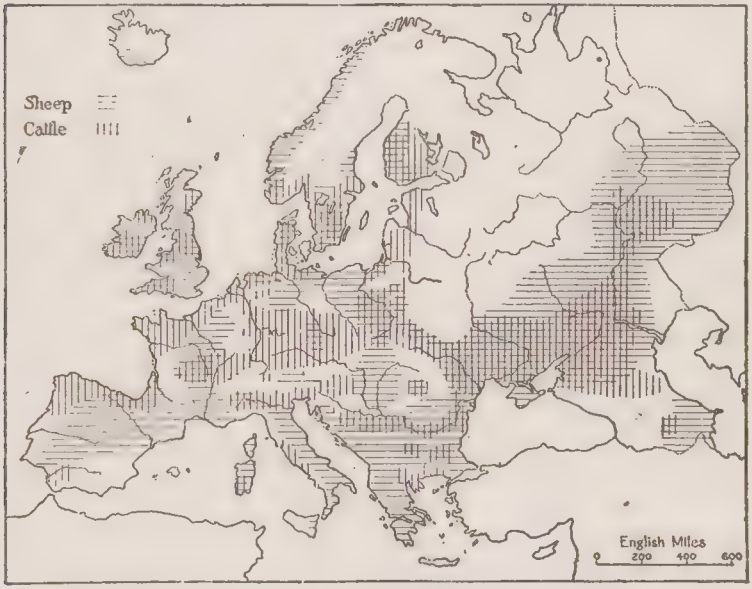


FIG. 63. Distribution of Sheep and Cattle.

almost all that now remain of the once numerous wild animals of Europe.

Man has introduced his own domesticated animals, as he has introduced his own cultivated plants.

The horse is found all over Europe, but in greatest numbers in the grass lands. It is less numerous in the mountain lands of the Mediterranean, where the mule becomes correspondingly more important. The donkey is important all over Central

and Southern Europe. Cattle are found throughout Europe, except in the north of the Scandinavian peninsula and of the Russian plain, but they are most numerous in the moister grass lands. Sheep become more important than cattle in the drier grass lands, on limestone pastures, on the steeper mountain slopes, and in the drier regions generally (see fig. 63). The goat replaces the sheep on still drier pastures, as, for instance, in much of the Iberian peninsula. The pig is an important domestic animal everywhere except in the northern forests. It is bred in immense numbers in the oak forests of Southern Europe. The reindeer is confined to the extreme north of Europe, where it lives on young sprouts and shoots in summer, and procures its winter food, the reindeer moss, by digging with its hoof in the snow. This hoof is broad and well suited for travelling over snow or over boggy yielding ground. The dog has followed man all over Europe. Another important group of domestic animals are the fowl, duck, goose, turkey, &c., which are bred both for their eggs and for their flesh. The common fowl is the most widely distributed, being found all over the continent except in the north of Eastern Europe. The others are most important in Central and Southern Europe, with the exception of the Iberian peninsula. Two other creatures of importance to man may be noted: the bee, which is found all over Central and Southern Europe, where honey is an important article of diet; and the silk-worm, which is reared in the Mediterranean lands where the mulberry on which it feeds can be grown.

Fisheries. Fishing is important in the shallow northern seas, where herring, cod, and flat fish are abundant. Off the fiord coast of the Scandinavian peninsula the summer fishing season is the busiest time of the year. Vast quantities of fish are salted, smoked, or dried in the sun, for export to countries of Southern and Eastern Europe, where fasting from meat is a religious duty. The deep seas of the Mediterranean are less rich in fish, but the tunny and sardine fisheries are important. The chief river fisheries are salmon in the

rivers of Northern Europe, and sturgeon in the rivers flowing to the Caspian.

Minerals. The mineral wealth of Europe is varied and widely distributed. Gold is found in small quantities in the Urals and the Carpathians; silver, though very common, especially along with lead, is nowhere found in very large quantities. Copper occurs in many parts of Central and Western Europe, in the Urals, and especially in the south of the Iberian peninsula, where lead is also found, as well as in the British Isles. Mercury is mined in the south of the Iberian peninsula, and platinum in the Urals. Coal and iron, the most useful, are also the most abundant and are constantly found together. Iron occurs in varying quantities in most parts of Europe, though it is least abundant in the Italian and the south of the Balkan peninsulas, and in the north and south-east of the Russian plain. Coal is found on the northern margin of the Central Highlands, in Britain, in the heart and south of the Russian plain, and in the Urals. Sulphur is obtained in the volcanic regions. Petroleum is found on the outer margin of the Carpathians in Rumania and Galicia, and at the eastern end of the Caucasus, where towns have grown up which depend entirely for their prosperity on oil. Salt is mined in Central Europe, and in the British Isles, and evaporated from the sea round the coast, especially in the Mediterranean.

Building stone and clay are almost universally found, except in the steppe lands.

Distribution of Occupations. Look at fig. 61, which shows the distribution of vegetation. If this were the only circumstance to consider the occupations of Europe would be few and simple. Along the coasts we should have a fishing population, who would procure the timber for their boats from the nearest forests. In the tundra, where the reindeer is the only domesticated animal, and agriculture is impossible, we should have a very poor life, without settled home, as the reindeer must continually move on to find new feeding

grounds. In the forests we should have small scattered villages, and these would tend to be along the rivers, which take the place of roads in the forest. Hunting would be important, and such industries would be carried on as timber cutting, boat building, saw-milling, the extraction of turpentine in the coniferous forest, and the various other occupations suited to the forest, including the fur trade. On the steppe we should have great herds of cattle, horses, and other stock, with their owners dwelling in tents, following their flocks and herds hither and thither, and engaged in working up the hair, wool, skins, tallow fat, &c., yielded by their flocks.

Examples of these simple occupations are found all over Europe, but they are no longer the only ones. Agriculture has been practised for thousands of years, bringing with it the settled home, which has changed the shifting village into the town or city. The process of clearing the forest, and, recently, of ploughing the steppe, has transformed Europe into an agricultural country, in which mixed farming, which combines agriculture with the rearing of stock, is the most important occupation. According to special circumstances one or other of these branches becomes more important, as, for example, the cultivation of wheat in the rich soils of the Danube plains, and the steppe; dairy-farming where rich moist pastures predominate, as in Ireland, or the Low Countries; or sheep-farming where there are large tracts of hill pasture, as in Wales, or the drier highlands of the Iberian peninsula.

As a country becomes agricultural, with a larger, richer population settled in cities and towns, new kinds of raw material are produced, new wants arise, and new occupations develop. Thus the clearing of the forest and the growth of settlement both makes houses necessary and provides the timber for them. The trades of the builder, joiner, carver, painter, develop, throwing off new branches as time goes on. The demand for better ploughs improves the smith's trade. The increase in the quantity of wool produced on sheep-

farms improves the weaver's trade, which in its turn requires machinery, and so on. Within recent years new trades such as the making of motor cars and aeroplanes have come into being, and all the trades connected with the use of electricity are quite young. Many of these trades are carried on in all the principal towns of Europe, and many of the more important in the villages also

More than a hundred years ago it was discovered that steam could be used to drive machinery, giving a greater output at less cost. On the coal-fields, where cheap fuel could be had, it became more profitable to use land for manufacture than for agriculture. All over the coal-fields of Europe the population is largely engaged in smelting metals, making machinery, and carrying on weaving, or textile industries of many kinds.

Another group of occupations is connected with the selling of goods made by others, whether in small shops, or in large warehouses, which trade with all parts of the world, employing clerks, travellers, railway servants, seamen and others.

Still another group is concerned with the care of the sick, the education of the young, the teaching of religion, the practise and administration of law, and the defence and government of the country. These occupations are known as professions, and are carried on chiefly in the capitals, but in a greater or less degree in all the towns and villages of Europe.

Density of Population. The density of population depends on the occupation. Where that is destructive, as in the case of hunting, the supply of food gradually becomes exhausted and population never increases to any great extent. Where men are engaged in increasing the food supply, either by breeding animals or by cultivating plants, a much larger population can be supported on the same area. Animals rapidly eat a given area bare, and must move to another, and thus more ground is required for keeping animals than for growing crops. We have already seen that in the British

Isles the agricultural counties support a denser population than the pastoral ones. Population is densest in the manufacturing districts, which do not grow their own food, but import it from other parts of the world. (See fig. 64.)

Peoples, States, and Languages. We can usually recognize a foreigner easily, because the people of different parts of Europe differ in height, figure, colour, and shape of the head, though not so much as Europeans differ from the natives of

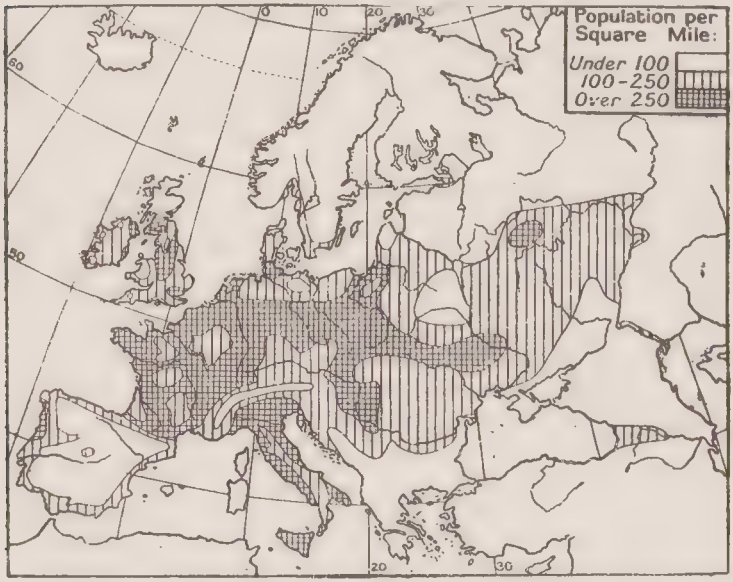


FIG. 64. Density of Population.

Eastern Asia or Africa. Except in the tundra, where men, like plants, are stunted, the peoples of Northern Europe are tall, slender, and fair-complexioned, with blue eyes and light hair. This type is commonest in the Scandinavian peninsula, and extends into our own country and across the Central Lowlands. It is called the Northern race. In the mountain regions of Central Europe and in the centre of the Eastern Lowlands the people are shorter and stouter, with broader

FIG. 65. Chief Political Divisions of Europe.

heads, and darker hair, eyes, and skins. This is called the Alpine race. A third group, found in the Mediterranean lands, is slighter, but still shorter and darker than the preceding, and their heads are longer and narrower. This is the Mediterranean race. These races extend across Europe from east to west, but they speak various languages, and belong politically to different states.

Fig. 65 gives a guide to the chief states into which Europe is divided. Their relation to the relief of the land should be studied in an atlas. The principal states bordering the North-land seas are as follows. Great Britain and Ireland occupy the British Isles; the kingdoms of Norway and Sweden occupy the Scandinavian peninsula. A third Scandinavian kingdom, that of Denmark, occupies the islands of the Sound at the mouth of the Baltic, and the peninsula of Jutland. On the southern shores of these seas, France borders the English Channel; Belgium and Holland lie about the Rhine delta; Germany has coast-lines on the North and Baltic Seas. The following also have coast-lines on the Baltic: Poland, the free city of Danzig, Lithuania, Latvia (Livonia, Courland), Esthonia, Russia, and Finland. Inland, in Central Europe, are Switzerland, an Alpine state, with Austria to the east of it; Chekho-Slovakia, and Hungary. To the east of the last, Rumania has a coast-line on the Black Sea.

Round the Mediterranean lie Spain and Portugal, occupying the Iberian peninsula, France, which has therefore a double advantage as regards sea, Italy including the Italian peninsula, the independent city-state of Fiume, and the Serb-Croat-Slovene kingdom, commonly called Yugo-slavia. This state extends into the Balkan Peninsula, and to the east of it, in the same peninsula, are Albania, Greece, and Bulgaria, with Constantinople, the capital of Turkey (whose territory is mostly in Asia). The republic of Andorra in the Pyrenees, the principality of Monaco on the Mediterranean, surrounded by French territory, the republic of San Marino in Eastern Italy, and

the principality of Liechtenstein, in the Upper Rhine valley, all very small, are of no political importance.

The whole of Eastern Europe is occupied by Russian lands. After the Russian Empire broke up, a number of peoples which were included in it established new states, or tried to do so, in addition to the central government. Of these, we have already mentioned the states bordering the Baltic Sea, and we shall hear of others when we come to study the Russian lands.

A large number of languages are spoken, but those used by nine-tenths of the people of Europe belong either to the Teutonic language, spoken for the most part by the Northern race; the Romance languages, spoken chiefly in the Western Mediterranean and derived from Latin; or the Slavonic, spoken in Eastern and South-eastern Europe. Turkish, spoken by Turks, Magyar, spoken in Hungary, with others less important, are of Asiatic origin.

THE SCANDINAVIAN LANDS.

Norway and Sweden. Look at the map of the Scandinavian peninsula, which consists of Norway (124,000 square miles) on the west, and Sweden (172,000 square miles) on the east (see fig. 66). Notice that the west coast is protected for most of its length by a fringe of islands, called the skerry guard, or skerry wall. This breaks the waves of the Atlantic, and makes calm channels between skerry wall and mainland. Notice also the long fiords running inland. Waterfalls descend from their mountain-walls, which in the Sogne and Hardanger Fiords rise to a height of 4,000 or 5,000 feet. Only here and there, as the map shows, is there flatter land along the coast. The whole of Norway is a mountain land, of which the higher parts are buried for many months under winter snow.

Sweden consists of the longer, gentler slope of the Scandinavian Highlands, which descend by a well-marked step, or

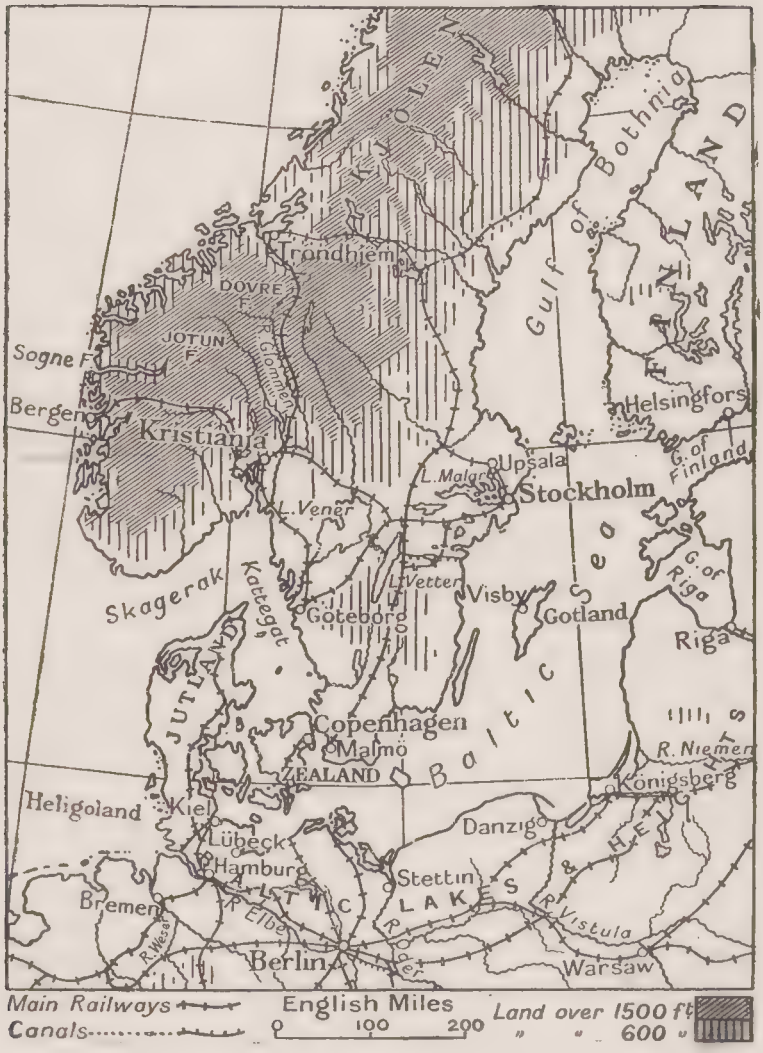


FIG. 66. Southern Scandinavia and the Baltic Sea.

terrace, to a wooded plateau which stretches across Sweden, sinks beneath the Baltic, and is continued into Finland. Sweden is a forest land, studded with many lakes.

The winters are long and dark, especially in the north, where, in the depth of winter, there is but an hour or two of daylight. But the summer has long days. At midsummer, in the northern half of the peninsula, the sun never sets, and for some weeks there is no darkness at night, but only an hour or two of twilight. Norway receives abundant rain, but Sweden is much drier. In this Scandinavia resembles Great Britain, and for the same reason.

In Norway there is not much agriculture, because the land is so mountainous; but in Sweden, especially in the flatter south, it is largely carried on in clearings in the forest. The long summer daylight shortens the time between sowing and harvesting. Both in Norway and Sweden the forest supplies timber for export, either unworked in the shape of lumber, as it is called, or manufactured into joinery, wood pulp, matches, &c. The rapid rivers float the logs and drive the saw mills. They also drive machinery for electric and chemical works, so that both Sweden and Norway have developed manufactures. The combination of fiord, skerry wall, and calm inner channels, and the necessity of seeking food elsewhere than in the barren interior, has made the Norwegians a nation of seamen. Fishing-fleets sail all through the season to the whale and seal fisheries of the Arctic seas, the cod, herring, and other fisheries of the Lofoden Islands, and to the fishing-grounds of the North Sea and the Atlantic.

Coal is worked in the Arctic islands of Spitsbergen, which belong to Norway.

The chief mineral wealth of Sweden is iron. The mines at Gellivara and Kirunavara, in the extreme north, are so important that a railway has been built across the central highlands to Narvik, a port free from ice all the year round. The iron mines of Dannemora, in the south, are also famous.

In both countries, and particularly in Norway, the towns are mostly on or near the coast. Hammerfest and other northern towns are engaged in the whale and seal fishery. Trondhjem, on Trondhjem Fiord, is a famous old cathedral city. Bergen, in the south, is a fishing and fish-curing centre. Kristiania, the capital, is on Kristiania Fiord, which penetrates far into the southern and richest part of the country. Stockholm, the capital of Sweden, on Lake Mälar, is a city of islands, bridges, lakes, and pine woods. Upsala, the old capital, is a university town. Göteborg is a busy port, trading in lumber and forest produce. It is connected with the capital by the Göta canal, which crosses the forested lowland, and passes through several lakes, including Vener and Vetter, the largest in Sweden.

Denmark (15,000 sq. miles), consisting of a peninsula and numerous islands, has a very large extent of coast-line, but few good harbours; the shores, except on the east, being sandy, with many lagoons. The shallow, winding Little Belt, between the mainland and Fyen, the broader and deeper Great Belt, between Fyen and Zealand, and the Sound, between Zealand and Scandinavia, are all important, for they lead from the Baltic to the North Sea, and a great volume of the trade between eastern and western Europe passes through them. The name of the capital, Copenhagen, on the Sound, illustrates the importance of this trade route. Its English form would be Chipping Haven, that is, Trading or Market Haven.[1]

The Baltic Heights extend into the southern portion of Jutland and the islands, nowhere rising over 600 feet. The peninsula of Jutland, though forming about two-thirds of Denmark, contains less than half the population. The land is mostly cultivated or pasture. Dairy farming is the great occupation. Glove-making is important.

Copenhagen, the capital and largest town, presents a beauti-

[1] Chipping is an old English word used in these senses in such names as Chipping Norton, in the Cotswolds.

ful appearance when approached from the Sound; 'a vision of steeples and palaces rising from the sea on a rich background of green.' The other towns are ports, or ferry towns. There are no long railways, but the trains are run on to large ferry boats, and thus direct communication is maintained between shore and shore.

The Faeroe or Sheep Islands, between the Shetland Islands and Iceland, belong to Denmark. Sheep-farming and fishing are carried on.

Iceland (40,000 sq. miles) is a large mountainous island in the Arctic Ocean, with a fiord coast except on the south. The only lowlands are in the south and south-west, and are of very small extent. The island is volcanic, Hekla being the best known of over a hundred volcanoes, active or extinct. Geysers, or hot springs, throwing up fountains of hot water at intervals, are also of volcanic origin. The greater part of the island, which rises to a height of 6,400 feet, is covered with snow, and the valleys are filled by glaciers, from which issue short rapid rivers forming waterfalls. The climate is too cold for agriculture, but the pastures are rich in the short summer, and feed excellent sheep, cattle, and ponies. Fishing is important. Only the coast and the lower valleys are inhabited. The capital is Reykjavik, in the south-west. Iceland is a separate state, but under the same king as Denmark.

THE NETHERLANDS.

The Netherlands, also called Holland, or the Low Countries (area about 12,600 sq. miles), occupies the delta of the Rhine. The river has brought down the soil which makes a great part of the country. This will be seen on a map, which will also show that there are no hills, and that the sea has eaten into the land, leaving remains of the old coast-line in the numerous islands. The Zuyder Zee is so enclosed by islands as almost to form an inland lake.

The coast of Holland is everywhere low, and, except for a border of low sand dunes, is often below the sea-level. To keep the sea from flooding it strong dykes have been built, and the low-lying polders, or meadows, are pumped dry by means of windmills, which are seen everywhere in Holland. Where the land is marshy it has to be drained, and the rivers have to be prevented by embankments and canals from cutting new channels across the soft soil. When all this has been done Holland is a fertile country, of which rather more than a quarter is agricultural land, and half as much more pasture land. The chief crops are rye, potatoes, hops, sugar-beet, and tobacco, and some wheat is also grown. Dairy farming is very important. The Dutch are famous cultivators of flowers, especially of bulbs, which do well in the loose soil. Manufactures are important and growing.

The position of Holland makes it an outlet of western Central Europe, and a great trade passes along the Waal (which receives the Maas, or Meuse, from the plateau of Lorraine), the Lek, and the Rhine, the principal distributaries of the Rhine. Rotterdam, on the Lek, is one of the greatest ports of Europe. Amsterdam, on the Zuyder Zee, is a shipping, banking, and commercial town, and the chief diamond-cutting centre of Europe. The capital is The Hague ('s Gravenhage), on the east coast. Utrecht, at the limit of the area liable to flood, is the most important town in the centre of the country.

BELGIUM AND FRANCE.

Look at the map of Europe west of the Rhine in figs. 67, 68. Notice that like Germany and Holland it consists of a lowland in the north, broken by the heights of Normandy and Brittany along its northern margin, and of highlands to the south. The lowland is narrowest in the east, where the highlands approach nearest to the North Sea, forming the kingdom of Belgium (area about 11,500 sq. miles). France (area about 213,000 sq. miles) occupies the remainder, extending from the English Channel on the north to the Mediterranean on the south, and from the Atlantic on the west to the Rhine on the east. The lofty Pyrenees, stretching from the Bay of Biscay in the Atlantic, to the Golfe du Lion (Gulf of the Lion, or Lions) in the Mediterranean, separate it from the Iberian peninsula to the south-west, while in the east the Jura cut it off from Switzerland, and the Alps from Italy.

Look again at the map and notice that this lowland is broadest in the west, where it stretches right across France from the Channel to the Pyrenees. It consists of four river basins (1) that of the Meuse and Scheldt, which flow to the Rhine delta, the northern part of the basin forming Belgium; (2) the Seine basin, drained to the Channel; (3) the Loire basin in the west, drained to the Bay of Biscay; (4) the basin of the Dordogne-Garonne, in the south-west, drained to the Bay of Biscay. All these, except the Garonne, which comes from the Pyrenees, rise in the Central Highlands.

The central part of the highland area is known as the Central Plateau. It is connected by the Plateau of Langres with the Vosges. To the east of the Vosges is the lowland of Alsace, forming part of the upper Rhine plain, and bordering that river, which here separates France from Germany. To

the east of the Central Plateau, separating it from the Jura and the Alps, is a smaller lowland, forming a fifth river basin, that of the Saône-Rhone. This lowland passes in the south-west into the lowland of Languedoc.

Trace on the map the course of these rivers. It will be

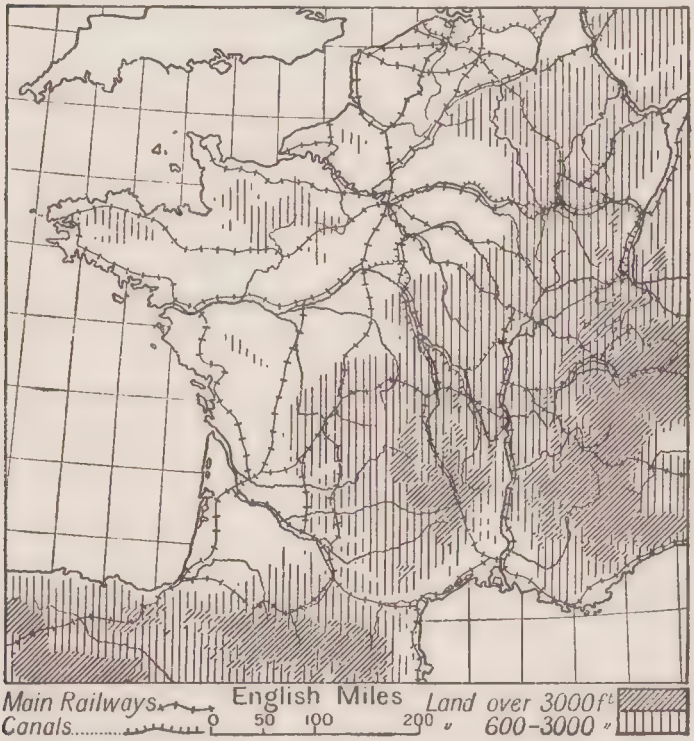


FIG. 67. Physical Features of France and the Bordering Lands.

seen from their direction that the Central Plateau is lowest in the north-west, and rises gradually to the south and east. It is highest on the east and south margins, where it is known as the Cevennes. The Cevennes, seen from the deep Rhone valley, which they border on the west, have the appearance of high mountains.

This Central Plateau is the poorest and most thinly populated part of France, with the exception of the upper slopes of the Alps and Pyrenees. It consists of high undulating plateaux, covered with poorish pastures, and of bare limestone tablelands. In the limestone the rivers cut very deep, narrow gorges, with sheer sides. In some the river-bed is as much

FIG. 68. Key to Physical Features of Fig. 67.

as 1,500 feet below the level of the plateau. Outside the limestone districts the valleys are wide, with sloping sides, which are cultivated. Towards the centre of the plateau is a region of extinct volcanoes. Large areas are covered by lava sheets, on which little will grow, and many volcanic cones rise above the plateau. The highest of the volcanic mountains is the Mont Dore, 6,000 feet high. Two deep

rifts opening to the north form the valleys of the Loire and Allier. The soil of the latter is composed of very fine volcanic dust, and is extremely fertile. The limestone heights (the Plateau of Langres) recall the Cotswolds. This plateau passes in the east into the plateau of Lorraine at the base of the forested Vosges. The Ardennes, to the north of the Lorraine plateau, the western continuation of the Lower Rhine Highlands, are wooded hills of the same type.

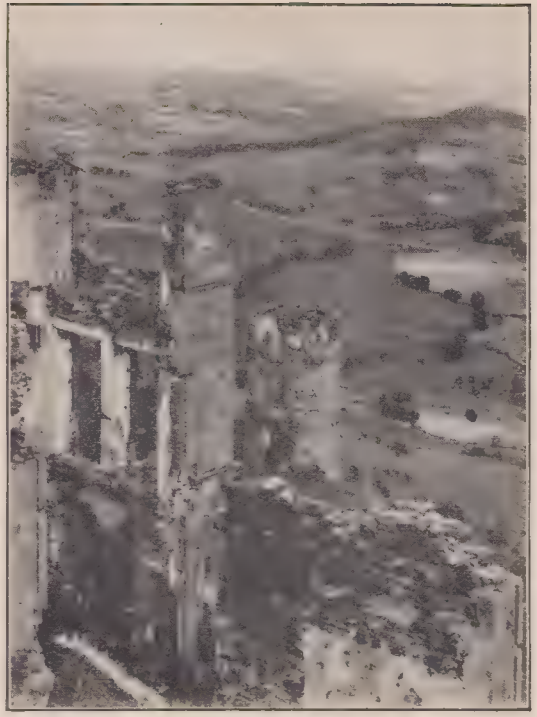
Climate and Products. The climate of Belgium and the north of France differs little from that of Southern England. The orchards of Normandy, from which large quantities of cider are made, are famous. Wheat is largely grown. The other crops are cereals, root crops, especially sugar-beet (figs. 73, 74), and flax in the east.

The summer heat increases to the centre and south, and the vine ripens south of a line drawn from the mouth of the Loire to the Ardennes, except on the higher parts. The south of France has the Mediterranean climate of winter rains and hot dry summers, and the olive, orange, lemon, mulberry, and other Mediterranean fruits ripen.

The mineral wealth is not great. The largest coal-field is in the Sambre-Meuse basin, and on it are situated the industrial towns of Belgium and North-east France. The French coal-mines were so much damaged during the great war, that by the peace France was given the mines of the Saar basin, north of Lorraine, but does not possess the land, which is German. A smaller coal-field is found round St. Etienne in the Central Plateau between the upper Loire and the Rhone on which iron industries are carried on. Many manufacturing towns are served by good waterways, both rivers and canals. These traverse most parts of the lowlands, especially in the north, and help to carry imported materials like coal, cotton, wool, and ores. Flax for the linen manufacture is largely grown in the country. Silk is manufactured in the south, especially in the Rhone valley, where silkworms are reared and coal is easily obtained from t' e St. Etienne coal-field.

IX. Norway: channel within islands: winter

X. Holland: a field of hyacinths



XI. France: the Auvergne country

XII. The Carpathians: Tatra Mts.

BELGIUM.

The kingdom of Belgium is a political division which does not correspond with any natural division. It consists of a lowland and a highland portion. The narrow lowland of Flanders and Brabant, drained by the Scheldt and its tributaries, widens west and east into the lowlands of France and Germany. The highland of the Ardennes, through which the Meuse flows in a gorge like that of the lower Rhine, has forests and pastures which supply timber and wool. Though Belgium was desolated during the Great War, it must be remembered that she had, and still has, great industries. Agriculture is important in the lowlands, except in the marshy north. The cultivation of flax, and the waters of the Scheldt and its tributary the Lys, good for bleaching, helped to develop the manufacture of linen. The Franco-Belgian coal-field (fig. 76) runs along the Meuse and Sambre, on both sides of the frontier. At the east end iron and zinc occur. Liége, noted as an engineering centre; the many towns on the coal-field famous for iron, textile, and other manufactures; Ghent, at the confluence of the Lys and Scheldt, a centre for cotton and linen; Antwerp on the Scheldt estuary, a great port for both Belgium and western Germany—all these illustrate the importance of Belgian industries. Ostend and Zeebrugge are other ports, and Brussels, the capital, in the centre, has been a great market for lace, gloves, and many other goods.

FRANCE.

The North-east. Although, during the great war, little more than a twelfth of the whole area of France was invaded, the parts which suffered, in the north-east, include some of the principal manufacturing centres, with the Franco-Belgian coal-field, the iron mines about Longwy and Briey, &c. In these parts are Lille, the adjoining towns of Tourcoing and Roubaix, Douai, Amiens, St. Quentin, Reims, and Nancy, all noted for various textile manufactures, and most of them for machinery;

Reims and Châlons-sur-Marne, also, as centres of the wine (champagne) trade; together with many smaller towns. Dunkirk, Calais, and Boulogne are the chief ports in the north-east.

The Seine Basin. The Seine basin, with the upper courses

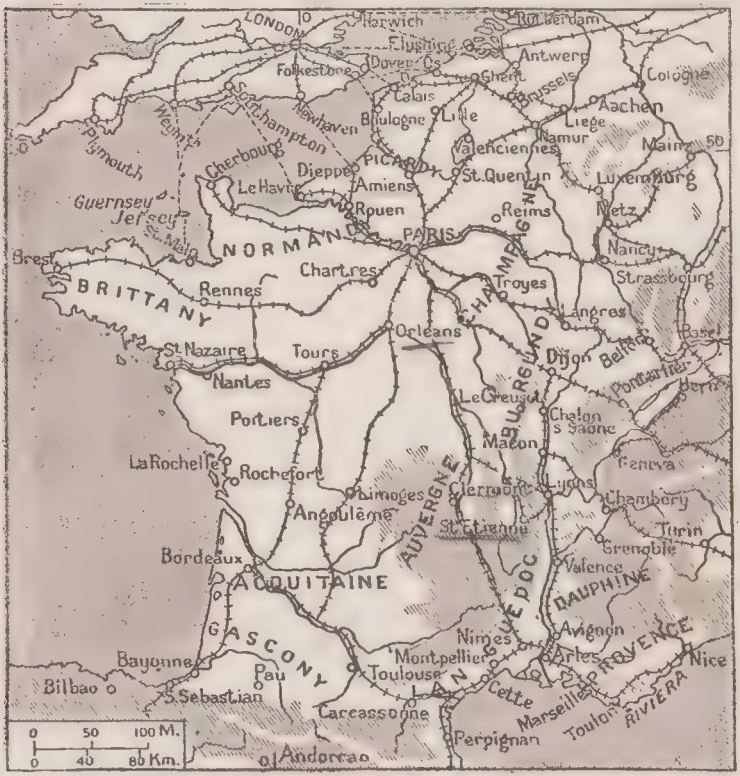


FIG. 69. Routes and Towns of France.

of the Meuse and Moselle, is a land of limestone scarps and clay plains, resembling the Thames basin. Sheep are kept on the hill pastures, and the steep slopes facing the sun are terraced for vines. Numerous cotton-manufacturing towns lie round the base of the Vosges, of which Nancy, on a tributary of the Moselle, is the chief. On the Moselle itself is Mettis (Metz), formerly a strong German fortress.

Look at figs. 67, 68, 69, and trace the Seine and its tributaries. The main stream flows north-west from the Langres plateau to the Channel. Its chief tributary, the Marne, on the right bank, comes from the plains and heights of Champagne, whose hill vineyards yield the famous wine. Reims, an old cathedral city, and chief town of the Champagne district, is a woollen centre. Paris, the capital of France, a little below the confluence of the Marne, is a magnificent city, with broad tree-lined streets, great squares, and fine ancient and modern buildings. It manufactures many articles of luxury and beauty, and is an important port. Up to Paris the Seine is navigable for smaller sea-going vessels, while ocean liners reach Rouen, the Manchester of France, the centre of the cotton manufacture of the Lower Seine, with a fine old cathedral. Le Havre, 'the haven' of Paris, at the mouth of the estuary, is the chief port of Northern France, with a great American and English trade.

The Norman Highlands consist of chalk pastures, with fertile valleys rich in orchards and corn lands.

The Loire Basin. The Loire is the longest entirely French river (the Rhine is longer). Trace its course on the map, and measure its approximate length. The main stream, and its chief tributary, the Allier, rise less than 100 miles from the Mediterranean, in the Cevennes, and flow north through the broad rifts in the plateau already mentioned. St. Etienne, on the coal-field between the Loire and the Rhone, is the chief industrial town of the plateau, and Clermont, on the edge of the fertile Allier rift overlooked by the Puy de Dome and other volcanic cones of Auvergne, the capital. Orléans is built where the Loire turns west, to flow through Touraine, 'the Garden of France'. Nantes, at the head of the estuary, and St. Nazaire at the mouth, are the ports of the Loire. The highlands of Brittany to the north resemble Cornwall and Devon in scenery, climate, and products. Brest, in the extreme west, is the Atlantic naval station.

The Garonne-Dordogne Basin. The Garonne rises in the

Pyrenees, and flows past the ancient city of Toulouse, across the fertile plain of Aquitaine, receiving on its right bank the Tarn, with its extraordinary limestone gorge, and, a little below the estuary of the Gironde, the Dordogne from Auvergne. Bordeaux, at the head of the estuary, a great port, is the outlet for the wine districts of the lower Garonne, which produce claret. South of the Gironde the coast is bordered by sand dunes (the Landes), which the sea-winds would drive inland but for the pine woods which have been planted.

The Saône-Rhone Basin. The Saône-Rhone valley is the great natural route from the Mediterranean to the north (see fig. 69). Notice in fig. 67 what an important break it makes between the highlands on either side. Trace the course of the Saône, and see how near it flows to the head waters of the rivers of the Moselle, Meuse, and Seine basins, and how, by the valley of its tributary the Doubs, it is connected between the Vosges and the Jura with the middle Rhine plain. The steep slopes of the mountains on the right bank produce the wines of Burgundy. Dijon, on a tributary, is the centre of this district. Lyon, at the junction of the Saône and Rhone, is the centre of the silk manufacture. Below Lyon the united river, known as the Rhone, receives on its left bank two tributaries, the Isère and the Durance, from the lofty Alps of Dauphiné. The valley widens out to the rich plain of Languedoc, famous for wine, and the hill land of Provence, famous for olive oil. The Rhone forms a great delta, with shifting mouths, and the port of the valley, Marseilles, is to the east of the delta. It is a magnificent city, one of the greatest ports of the Mediterranean, and the centre of many industries. Cette, on the Golfe du Lion, exports the wines of Languedoc. Toulon, east of Marseilles, is a naval station. The coast beyond, called the Riviera, is famous for its beauty and mild winter climate. Nice is the most famous of its many health resorts. Monaco is a small independent principality.

Alsace. The Upper Rhine Plain, of which, as we have

seen, Alsace forms the western part, is rich and highly cultivated. Though the winters are cold the summers are hot, and the autumns are dry and warm. The sunny slopes of the hills are terraced for vineyards, the plain is planted with many kinds of grain, hops, tobacco, and fruits. At the higher levels are pastures and woodlands. The principal towns are Stras-

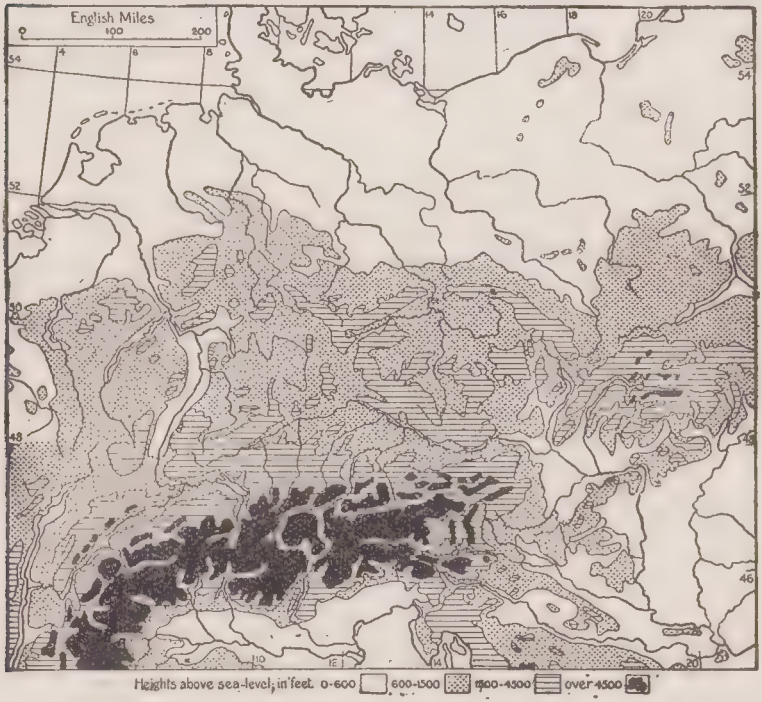


FIG. 70. Physical Features of Central Europe.

bourg, with a university and many manufactures, and a group of towns where cotton is manufactured, of which Mulhouse (Mühlhausen) is the chief.

GERMANY.

The republic of Germany has an area of about 172,000 square miles. North Germany consists, as we have seen, of

lowland—plains broken by the Baltic Heights in the northeast, and by outlying hills of the Central Highlands in the west. South Germany is part of the Central Highlands of Europe. Germany extends from the Northland Seas to the Alps, and from the Low Countries and the Middle Rhine to Poland. Beyond the short stretch of Polish coast on the Baltic Sea, and that of the free city of Danzig, there is a piece

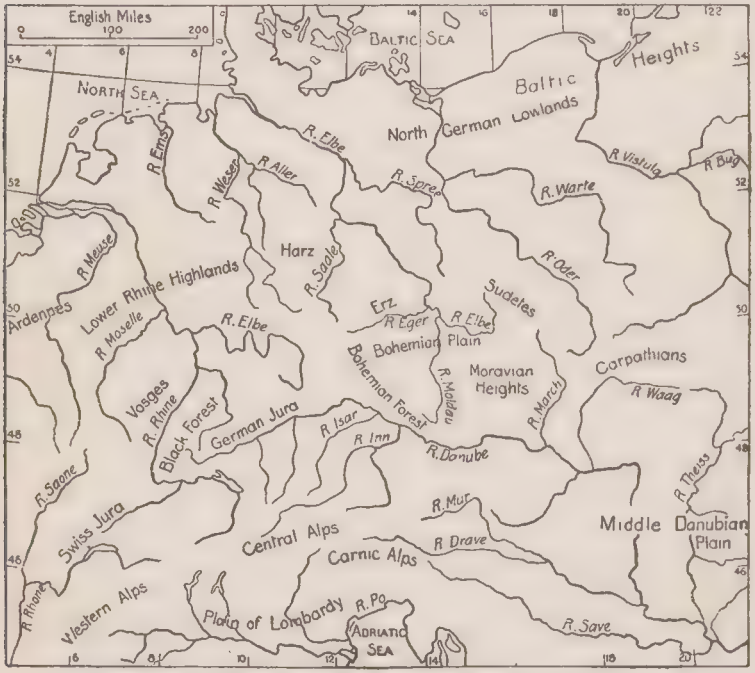


FIG. 71. Names of Physical Features of Central Europe.

of German territory, separated from the rest, bordering the Baltic. The coast on the North Sea is flat and in parts marshy. East of the Jutland Peninsula the Baltic coast is bordered by the Baltic Heights, a forested, rather unfertile belt of country with many shallow lakes.

Climate and Products. If north and south were equally low, the south would naturally be warmer than the north, but

as the north is on the whole low, and the south on the whole high, there is not so much difference in temperature between them. The climate is more equable in the west than in the east, for reasons already explained, and the east is drier than the west.

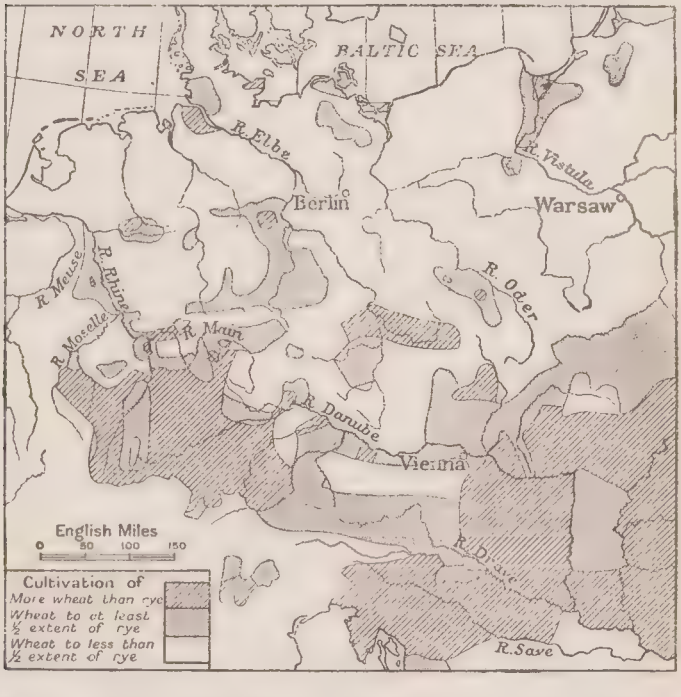


FIG. 72. Relative Importance of Wheat and Rye in Central Europe. The ruled parts indicate areas where more wheat is cultivated than rye, the dotted parts indicate areas where wheat is grown at least to half the extent of rye, and the white parts indicate areas where wheat is not grown to half the extent of rye.

The soil is generally fertile, though in many parts of the east it is too sandy to suit all crops. The richest agricultural land is in the west, where wheat is grown. On the poorer soils of the north and east rye and oats are the chief grains cultivated (fig. 72), and large areas are planted with potatoes (fig. 73) and the sugar-beet (fig. 74), both of which give rise

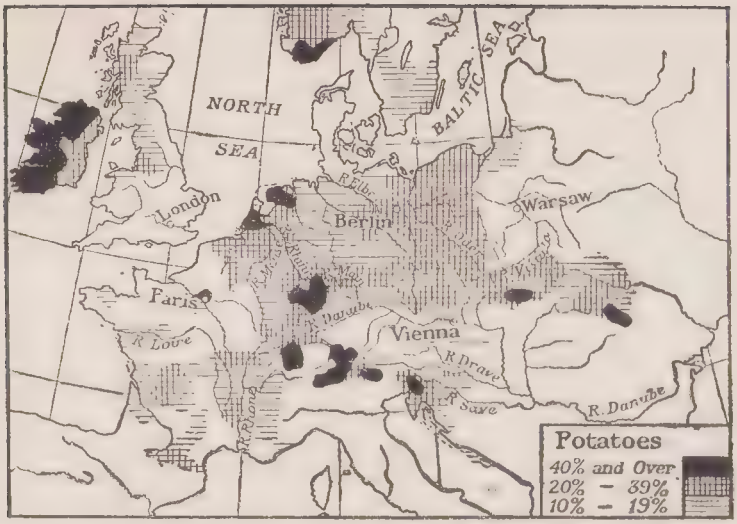


FIG. 73. Map showing the Relative Importance of Potato Cultivation in Central and Western Europe.

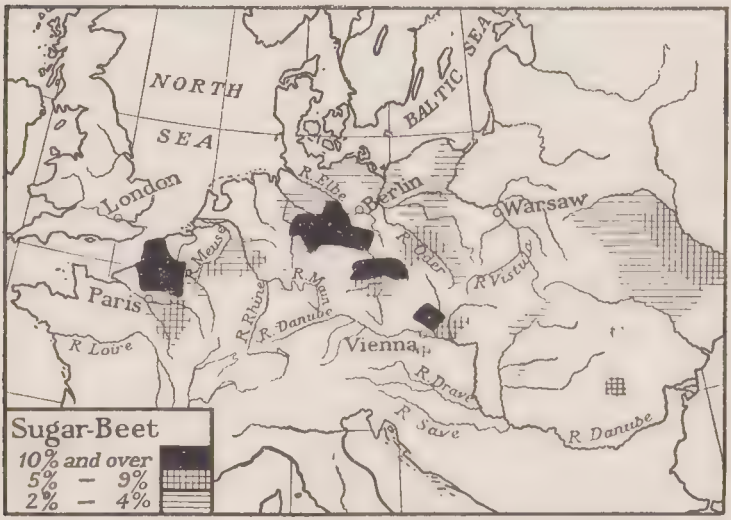


FIG. 74. Map showing the Relative Importance of Sugar-Beet Cultivation in Central Europe.

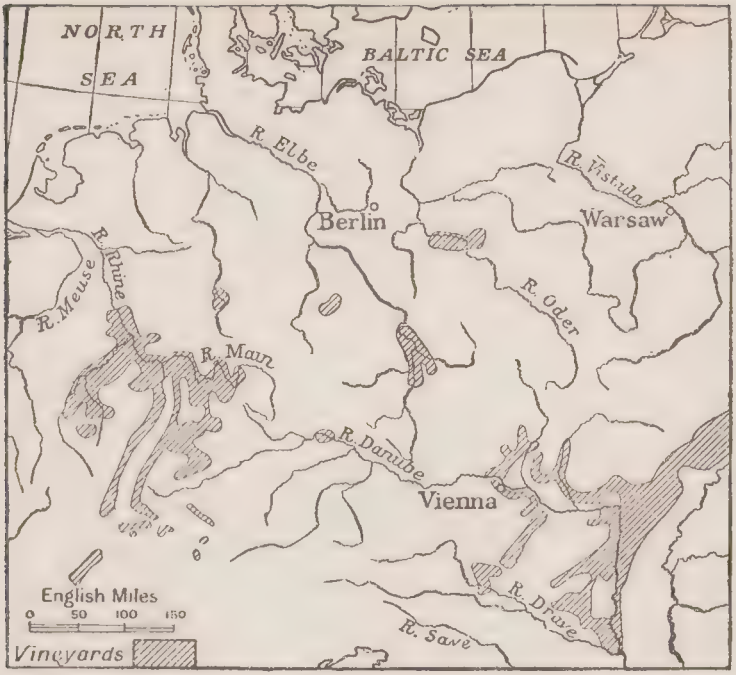


FIG. 75. Distribution of Vineyards in Central Europe.

FIG. 76. Distribution of Minerals in Central Europe.

to important industries, spirits being extensively manufactured from potatoes, while sugar is made in enormous quantities from the sugar-beet. The manufacture of wine is important wherever the vine will ripen (fig. 75), and beer is made wherever hops can be grown or cheaply obtained (fig. 77).

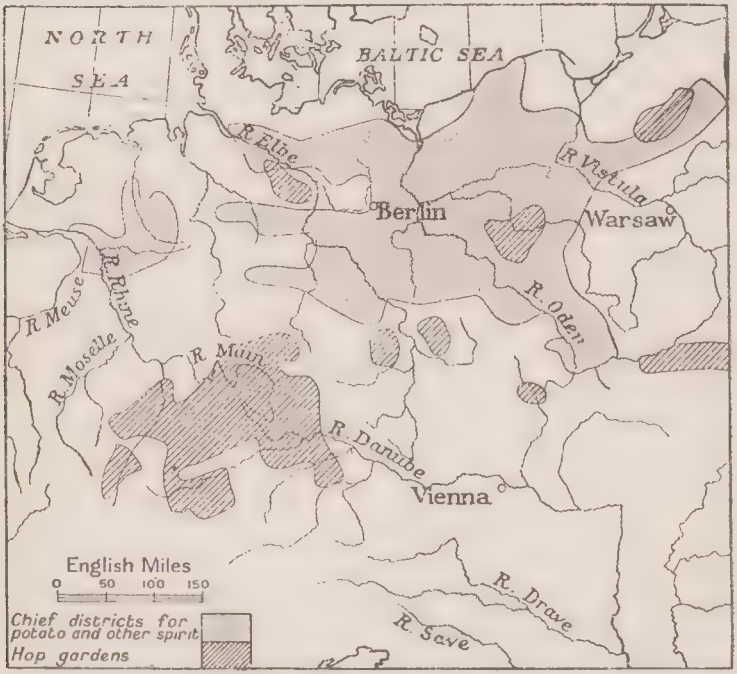


FIG. 77. Distribution of Spirit (so-called Brandy) Manufactures (mainly from potatoes) and of Hop Gardens in Central Europe.

The many navigable rivers and canals, with good ports at their mouths (fig. 79), allow raw materials to be cheaply carried to the coal-fields, on which the manufacturing towns are situated. These coal-fields are found on the northern margin of the Central Highlands where the Rhine, Elbe, and Oder and their tributaries leave them, and are known as the Westphalian, Saxon, and Silesian coal-fields. In the sheep-rearing districts

wool is manufactured locally. Many parts of the highlands are rich in minerals, and mining and the various industries resulting from it are important (see fig. 76). The forests add to the wealth of the country.

Rivers. On fig. 71 will be seen the names of the rivers which drain North Germany. Their courses are generally similar. But while the other main rivers of Germany rise in the Central Highlands, the Rhine, the most westerly, alone crosses them.

The Rhine Basin. The Rhine rises in the Alps by two main streams, flowing north through magnificent scenery to the Lake of Constance. On leaving this lake it turns west, and passes in a narrow valley between the Swiss and German Jura, forming the falls of Schaffhausen. It then turns north again, and enters a fertile plain, from twenty to twenty-five miles wide, bounded by the slopes of the Black Forest, with their rounded summits, on the east, and the similar but lower Vosges on the west. The river here separates Germany (Baden) from France (Alsace) and the plain has been described already (p. 132). It is well cultivated, and the valleys running up into the hills are hardly less rich. Their bottoms and lower slopes are cultivated in the same manner as the plain, while higher are beautiful meadows, above which rise the dark pine woods from which the Black Forest takes its name. The brooks which rush down the valleys turn saw mills, in which are sawn the timber cut on the hill-sides above. The peasants are skilful wood-carvers, and make carved clocks and other fancy wooden articles, as well as wooden toys. The chief German towns of this Upper Rhine Plain are Freiburg, a university town, with a fine cathedral, situated at the mouth of one of the most beautiful valleys of the Black Forest; and Karlsruhe, connected with the Rhine by a ship canal, with engineering works.

The first important tributary is the Neckar, on the right bank, which drains the Swabian Jura, flows past Stuttgart, the capital of Württemberg, and enters the Rhine after passing

between the Odenwald and the northern outliers of the Black Forest in a narrow forested gorge, at the mouth of which stands the university town of Heidelberg, with its romantic ruined castle. The cathedral towns of Spires and Worms lie in the plain, just above and just below the busy river port of Mannheim, where the Neckar enters the Rhine.

The Main, the most important of the Rhine tributaries, enters on the right bank some sixty miles below the Neckar. Look at the map, and notice how its head-streams collect the waters of the Fichtel Gebirge and the Franconian Jura, as it flows across Bavaria. The chief town of the upper Main is Nürnberg (Nuremberg) on a tributary, a famous commercial and artistic town in the Middle Ages, and now a manufacturing town. Its walls and towers still stand, and its magnificent churches and old houses make it one of the most interesting cities of Germany. Hops are largely grown all over Bavaria, which is famous for its beer. On the lower Main the chief city is Frankfurt-on-the-Main, an old historical city, now largely rebuilt. It is a trading and banking city, and has become an important river port by the deepening of the Main. Mainz, at the confluence of the Main and Rhine, is also a manufacturing city and river port.

A little below Mainz the Rhine again turns north and enters a beautiful gorge. The hills enclosing it are forested, or covered with terraced vineyards, while on every crag is the ruin of some old castle, towering over the small towns which stand at the water's edge, wherever the gorge widens a little. The river itself carries much passenger and cargo traffic, and rafts of timber floating down to the delta, where there are no woods. About half-way through the gorge the Rhine receives two tributaries entering almost opposite each other, the Lahn on the right bank, and the Moselle on the left. Coblenz, a busy port and manufacturing town, is built at the confluence of the Moselle. This river, with its tributary the Saar, drains the French slopes of the Vosges, and enters the Rhine through a long forested gorge. To the west of its confluence with the

Saar is Luxemburg, the capital of the small independent Grand Duchy of that name (area about 1,000 square miles). The main stream of the Rhine on leaving the mountains enters the North German plain, across which it flows in a north-westerly direction. Wheat and rye are grown on the agricultural land, as well as oats, potatoes, and hemp. The Rhine flows past Cologne (Köln), a city famous for nearly two thousand years, with the largest Gothic cathedral in Europe, a port for ocean steamers, and one of the busiest towns of North Germany. Düsseldorf is a great port and manufacturing town, as is Duisberg at the confluence of the Ruhr. This tributary, entering on the right bank, flows through the richest coal-field of Germany, on which are the towns of Barmen-Elberfeld, where all kinds of articles are manufactured, and Essen, with steel and machinery works. Since the Great War, France has occupied the Ruhr country, and its mining and industries have been much reduced. Soon after receiving the Ruhr the Rhine turns west, and begins to break up into numerous distributaries, forming the delta which is occupied by the Netherlands.

The Rhine is navigable from Strasbourg, in Alsace, to the sea. Ocean steamers reach Cologne, where their freight is transferred to river steamers.

The Upper Danube Basin. The Danube is the only German river which does not flow north. Look at figs. 70, 71, and trace its upper course in Germany, between the German Jura and the Bohemian Forest on the north, and the Bavarian Foreland on the south. Its source is in the Black Forest, a few miles only from the Rhine; it receives tributaries on the left bank from the Swabian and Franconian Jura, and on the right bank from the Bavarian Foreland. The latter are too swift for navigation. The most important are the Iller, with the cathedral town of Ulm at its confluence, and the Lech, flowing past Augsburg. Both Ulm and Augsburg were important route and trading towns in the Middle Ages, as was also

Ratisbon, or Regensburg, at the confluence of a tributary from the Bohemian Forest on the left bank. All these are still important points on the great route to the east by the Danube valley. The last important German tributary of the Danube is the Isar, on which is Munich, the capital of Bavaria. The Bavarian Foreland is covered with pine forests, with pastures on their lower slopes, where cattle are reared in large numbers. The flatter land along the lower courses of the rivers and along the Danube is cultivated.

The Weser Basin. The Weser has only half its course in the plain, which is here narrowest between the sea and the highlands. It is formed by the Werra from the Thuringian Forest, and the Fulda, from the highlands of Hesse, both beautifully wooded. On the east, separating its basin from that of the Elbe, rise the Harz Mountains, rounded, forest-clad hills, rich in minerals, the highest point of which is a bare round-topped hill, the famous Brocken. The Weser leaves the highlands in a narrow gorge, known as the Westphalian Gate, and flowing across the cultivated plain receives the Aller, with its tributary, the Leine, on which stands Hanover. This town, and Brunswick, are the two principal towns of the agricultural district between the Elbe and the Weser, both containing many of the fine old-timbered houses which make the Harz towns so picturesque. The port of the Weser is Bremen, at the head of the estuary, the rival of Hamburg for the trade of Central and Southern Germany.

The Elbe Basin. The Elbe is the most important river of North Germany. Its tributaries make it the outlet of a large and wealthy hinderland. It rises beyond the German frontier in Bohemia, where its many tributaries drain the mountains which enclose Bohemia, the Erz Gebirge, or Ore Mountains, on the north-west; the Böhmer Wald, or Bohemian Forest, on the south-west; the Riesen Gebirge, or Giant Mountains, and the other ranges which make up the Sudetes Mountains on the north-east; and the Moravian Highlands on the south-east. From the position of all these in figs. 70, 71, it will be

seen how they enclose the diamond of Bohemia between them. The line of the Bohemian Forest is continued through the Fichtel Gebirge, or Fir Mountains, the Thüringer Wald, or Thuringian Forest; the line of the Sudetes is carried in a more broken manner through the detached Harz Mountains towards the Weser Highlands in the north-east, while the line of the Erz Gebirge is continued through the Fichtel Gebirge and the Franconian and Swabian Jura to the Rhine, and beyond the Rhine as the Swiss Jura.

The Elbe, after receiving its Bohemian tributaries, enters Saxony in a fine gorge, between the outliers of the Sudetes on the east, and of the Erz Gebirge on the west, forming a picturesque region of perpendicular valleys of great depth, and isolated flat-topped hills, known as the Saxon Switzerland. It leaves the mountains as a broad, shallow stream, not always navigable in dry seasons, and passes Dresden, the capital of Saxony, a handsome town, with fine art galleries, public gardens, and beautiful pine-forested environs. Below Dresden it flows across the plain, with marshy or forest land on its right bank, and on its left agricultural districts cultivated with potato and sugar-beet. Its tributaries on the left bank drain the German slopes of the Erz Gebirge, the Thuringian Forest, and the eastern slopes of the Harz. The most important are the Mulde, round which is the Saxon coal-field, with the manufacturing and mining towns of Chemnitz and Freiberg, and the Saale, formed by the union of tributaries from all the mountains just named, which supply timber in its many forms, and feed the sheep which yield the famous Saxony wool, from which Saxony flannel is manufactured. The Erz Gebirge, or Ore Mountains, are rich in minerals, as the name suggests. The chief towns of the Saale basin are Leipzig, on its tributary the Elster, a centre of the German book trade, and Halle. Not far below the confluence of the Saale is Magdeburg, a centre of the sugar manufacture. On the right bank the Elbe receives the Havel, on a tributary of which, the Spree, stands Berlin the capital, a town for the most part quite

modern. Like all modern capitals it is the centre of many industries, especially of those which supply luxuries for the wealthy resident population. It is one of the great railway centres of the empire, and of Europe (see fig. 78). It is connected by canal with both the Elbe and the Oder, whose ports

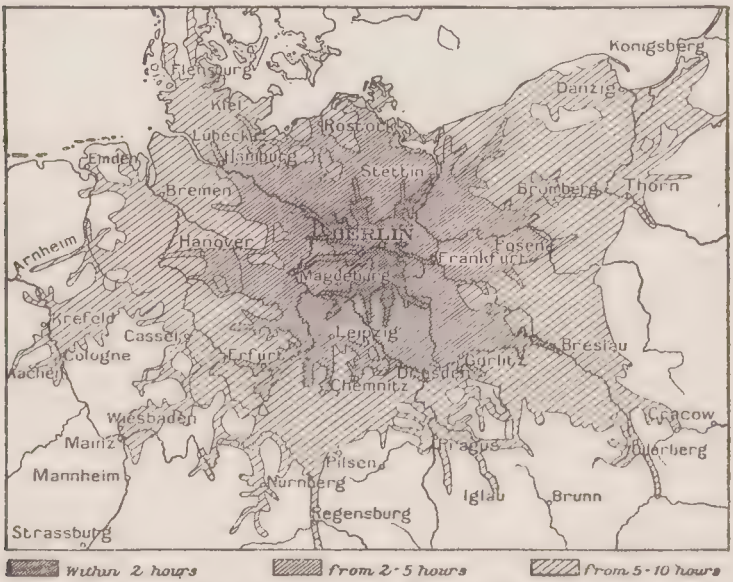


FIG. 78. Routes from Berlin, indicated by lines showing time required in travelling by express train. All places in the darkest area are within two hours' journey of Berlin, all in the white area are over ten hours' journey from Berlin.

Stettin and Hamburg are, therefore, both ports of the capital. (See fig. 79 and atlas.)

Hamburg, at the mouth of the estuary of the Elbe, is the greatest German port. The traffic down stream consists of the produce of its hinderland, especially the mineral wealth of Saxony and Bohemia and the manufactured articles of the Saxon coal-field. Hamburg is connected by canal with the Baltic port of Lübeck, on the Trave, the boundary between Schleswig-Holstein and Mecklenburg; Kiel, to the north of Lübeck, is connected with the Elbe estuary below Hamburg

by the Kiel Canal, and the Elbe is thus in direct communication with the Baltic as well as with the North Sea.

The Oder Basin. The Oder, though it rises beyond the German frontier in Moravia, is German for the greater part of its course. Short tributaries on its left bank drain the pine-forested slopes of the Riesen Gebirge, or Giant Mountains, which separate Silesia from Bohemia. The main stream flows

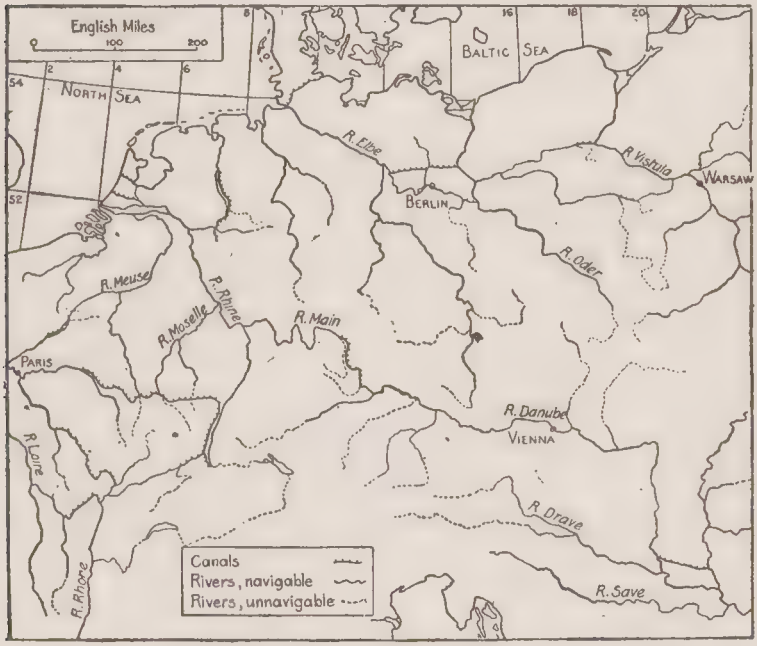


FIG. 79. The Navigable Waterways of Central Europe.

across the plains of Silesia, through an agricultural land decreasing in fertility to the north and east, where some wheat, but much more rye, potatoes, sugar-beet, and flax are grown. Sheep are fed in the mountain districts, and their wool is manufactured in a number of small towns. On the Silesian coal-field in the south-east of the Oder basin is Breslau, on the main river, the capital of Silesia, manufacturing cotton, woollen,

and linen fabrics. Frankfurt-on-the-Oder is a sugar manufacturing town, in the centre of the sugar-beet district. Stettin, at the head of the lagoon, or haff, of the same name, is a shipbuilding centre, where some of the largest liners are built, and an important port.

POLAND.

Poland, lying between the German and the Russian lands, and between the Baltic Sea and the Carpathian Mountains, has an area of about 88,000 square miles. The main natural line of communication through the country from south to north is the river Vistula, and it and its chief tributaries are navigable for many hundreds of miles. Danzig, at its mouth, is the natural port of Poland, but does not belong either to Poland or to Germany, being a free city. Poland has no port on its short stretch of coast-line west of Danzig. On the northern slopes of the Carpathians and their foreland Polish territory includes lands rich in coal, zinc, lead, and other minerals. Salt is found near Cracow, the old capital, on the upper Vistula. The forests are valuable, and flax, rye, and sugar-beet are grown in the clearings. Warsaw, the capital, on a fertile plain on the Vistula, is a centre where routes meet from all directions. The chief manufacturing town is Lodz, and its chief product is cotton goods.

THE ALPINE AND CARPATHIAN LANDS.

Central Europe is cut off from lands to the south of it, and from the Mediterranean Sea by a broad belt of high mountains. This consists of the Alps in the west, beginning at the Mediterranean, running north to the east of the lower Rhone valley, and gradually curving eastwards. They are separated from the Central Highlands of Europe by the upper Danube valley. The Alps broaden to the east, where the Danube valley narrows between them and the southern mountains of Bohemia. From their broad eastern margin spring the Dinaric Alps at the southern end, extending along the Dalmatian coast of the Adriatic. From the northern end the great

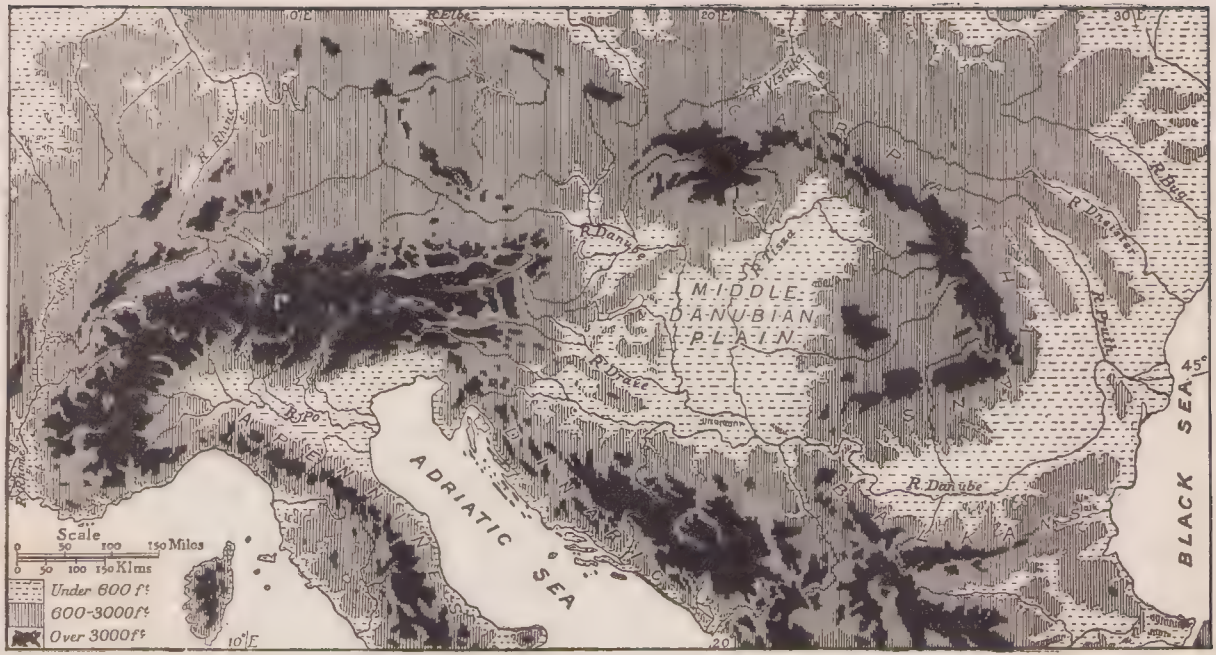


FIG. 80. Physical Features of Alpine and Carpathian Lands.

semicircle of the Carpathians curves round, enclosing the broad plain of the middle Danube, which has broken through, between the Alps and the Carpathians, in what is called the Hungarian Gate. (See fig. 80.)

The Alps. We are accustomed to think of the Alps as in Switzerland, but politically they are in five countries, Italy, France, Switzerland, and Austria, while a little strip is in Germany. They are broadest in Austria, while the highest

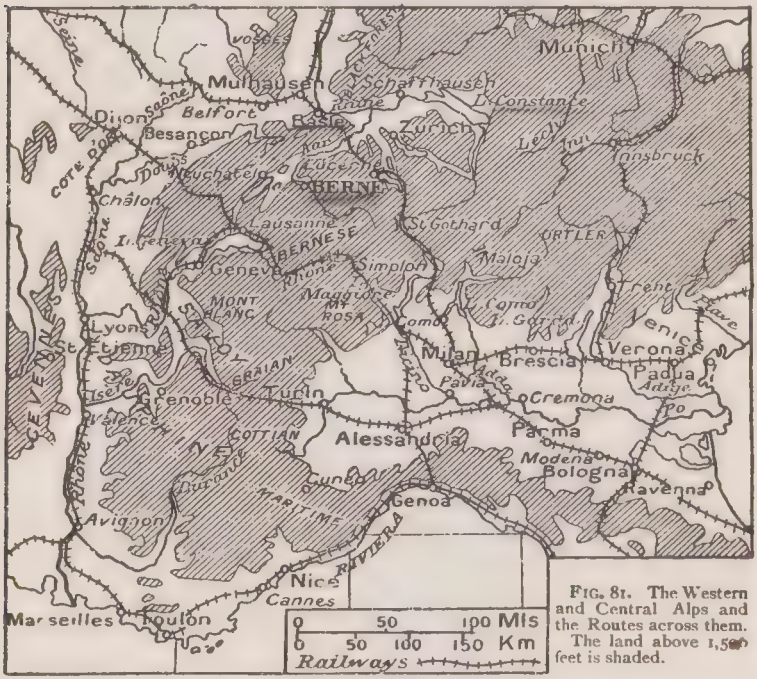


FIG. 81. The Western and Central Alps and the Routes across them. The land above 1,500 feet is shaded.

summits, Mont Blanc and Monte Rosa, both over 15,000 feet, are in France and Italy respectively, though close to the Swiss frontier. The easiest approaches to them are, however, in Switzerland, which contains the largest glaciers of the Alps, the upper courses of three out of the four great rivers which drain them, and much of the most magnificent scenery.

Look at fig. 81, and find the St. Gothard group, from which flow the rivers mentioned—(1) the Rhone, flowing to

the Golfe du Lion; (2) the Rhine, flowing to the North Sea, and two of its tributaries, the Aar, flowing through the lakes of Brienz and Thun, and the Reuss, flowing through the lake of Lucerne to the Aar; and (3) the Ticino, one of the head streams of the Po, flowing to the Adriatic. Notice how these river valleys radiate like the spokes of a wheel from this centre, which commands the routes along all of them.

The Rhone rises in a great glacier and flows west in a deep valley, which separates the Bernese Alps on the north from the Pennine Alps on the south. It turns north near the foot of Mt. Blanc, and breaks through the mountains to the blue lake of Geneva through which it flows. On leaving the lake it flows round the southern end of the Swiss Jura, and west to the valley of the Burgundian Saône, which it enters at Lyon. Its tributaries, the Isère and Durance, drain the outer margin of the Western Alps, between Mt. Blanc and the Mediterranean.

The Rhine flows in a direction exactly opposite to the infant Rhone, and after receiving a second head-stream turns north, cutting its way through the mountains to Lake Constance, through which it flows. On leaving the lake it turns west, receiving the Aar, which collects the waters of the valleys opening to the north, many of which are filled by long, narrow, mountain-girt lakes of great beauty, and of Lake Neuchâtel, at the base of the Swiss Jura. The Rhine flows west between the Black Forest and the Jura, and then turns north where Basel is built and enters its upper plain (p. 132).

The Ticino flows south in a direction exactly opposite to that of the Reuss, through Lake Maggiore, which corresponds in situation with Lake Lucerne. The map shows that the Ticino valley is but one of many parallel valleys running south, some with lakes similar to those of the valleys opening northwards. All these valleys but one are drained south to the main stream of the Po, which flows at right angles to them, having risen in the Western Alps, near the source of the Durance. The river of the one parallel valley which is not drained to the Po is the Etsch, or Adige, which runs to

the west of the Ortler group, and flows to the Adriatic by a course parallel to the Po. (See fig. 81.)

The Danube, the fourth of the great Alpine rivers, rises in the Black Forest, and receives only one tributary from the Swiss portion of the Alps, the Inn. East of the Inn the valleys of the Eastern Alps run from west to east, and their waters are carried to the Danube by the Drave and Save, both of which, after leaving the mountains, have long courses across the Middle Danubian plain (fig. 80). The main stream of the Danube, after receiving the Inn, flows in a magnificent gorge through the Austrian Gate, between the outliers of the Alps and of the Bohemian Forest. Its valley then widens to the plain on which Vienna is situated. After passing Vienna it flows past Bratislava (Pressburg), where at the Hungarian Gate the highlands again approach the river for a short distance. It now flows first east and then due south across Hungary as a broad and noble stream, watering what we have called the Middle Danubian Plain; its surface diversified by numerous wooded islands. It turns east again below the confluence of the Drave, and breaks through the Carpathians in a gorge of great beauty, the sides of which in places reach 2,000 ft. At the Iron Gate, made navigable by a canal, it enters the Lower Danubian Plain or plain of Wallachia, which it crosses to the Black Sea, forming a large and swampy delta.

The general character of the Alps is the same throughout their whole extent. Along the line of greatest height many peaks rise above the snow-line, and are separated from each other by vast snow-fields and valleys filled by glaciers. Below the snow-line are the alps, or summer pastures, where flocks are fed in summer, yielding the famous Swiss milk, cheese, and skins for glove-making and other uses. Lower down the valley the forests begin, the uses of which have already been described. Permanent dwellings are few in the forest zone, but increase as the valleys descend to the level where agriculture can be carried on.

There are many passes across the Alps, of varying height

and difficulty. The chief railway routes are (1) the Mont Cenis route, which uses tributaries of the Isère and the Po, (2) the Simplon route, using the upper Rhone and a tributary of the Ticino, (3) the St. Gothard, using the Reuss and the Ticino (all with long tunnels through the core of the Alps), (4) the low Brenner route, using the valleys of the Inn and the Adige. (See fig. 81.)

The Jura are part of the Alpine system, but much lower. They consist of broad ridges and hollows, with picturesque valleys, ravines, lakes, and pine-forests. Cattle-keeping is important, and many busy manufactures are carried on in the numerous small towns.

The Carpathians are highest in the east, where they rise to nearly 9,000 feet. The greater part of the range, however, does not rise above the tree-line, and is thickly forested. The waters of the Carpathians reach the Danube by the Tisza, on the left bank, not far above the confluence of the Save.

SWITZERLAND.

The federal republic of Switzerland (area about 16,000 sq. miles) occupies the plateau between Lakes Geneva and Constance, with the bordering Jura to the north, and the Alps to the south-east. The climate is like that of Central Europe generally, except in the mountains, where the temperature is lower. The Alpine area is engaged in pasturage, supplying condensed milk and cheese, agriculture, and in providing for tourists. The industrial towns are on the plateau. There is no coal in Switzerland, and industries are carried on either by imported coal or by water power, which is very abundant. This is used in the various electrical industries, which are important all over Switzerland. Villages and hotels almost at the snow-line are lighted by electricity, and most of the mountain railways are driven by electric power. The chief industries are the silk manufacture, materials for which are obtained from Italy by the St. Gothard route, carried on chiefly at Zürich and Basel, cotton, manufactured round

Zürich and St. Gall, and the manufacture of textile and electrical machinery with Zürich as the centre. There are numerous small industrial towns in the Jura, where watch-making is carried on. Geneva is the commercial centre of this manufacture. The capital is Bern, on the Aar, in the centre of the plateau.

AUSTRIA.

The Austrian republic (about 35,000 sq. miles) includes all or parts of the districts of Tirol, Salzburg, Carinthia, and Styria in the Eastern Alps, together with the districts known

FIG. 82. The Austrian Alps. Routes and Towns.

as Upper and Lower Austria lying along the Danube. The population is mostly German. The climate of the southern Alpine valleys is more genial than the northern, and the vine flourishes. The forests, principally of coniferous trees, are valuable. The Alpine foreland towards the Danube is good agricultural land.

Vienna, the capital of Austria, on a rich plain, is built on the Danube, where the eastern spurs of the Alps reach that river. It commands the routes by the upper Danube, leading

to Central Europe, as well as those of its lower basin. Routes from all parts of Europe pass through Vienna. The Danube is navigable both up and down stream. The situation of the city between the mountains and the river is very picturesque. It has broad streets planted with trees, like those of most of the great cities of continental Europe. The important towns of the Alpine region are Innsbruck on the Inn, at the northern end of the Brenner route, the capital of Tirol, Salzburg on a tributary, and Graz, on a tributary of the Drave, near a small coal-field, the only industrial town of the Alpine provinces. All three are situated in magnificent scenery.

Austria has no coast, but commands part of an important railway route, between Vienna and the head of the Adriatic Sea, with the port of Trieste. This route follows the Semmering Pass across the Eastern Alps. It forms the principal outlet to the Adriatic, not only for Austria, but for Chekho-Slovakia (see below), which also has no coast; and trains belonging to the railways of Chekho-Slovakia may use the route.

CHEKHO-SLOVAKIA.

Chekho-Slovakia (or Czecho-Slovakia, but the first spelling shows more nearly how the name is pronounced) is a republic (area about 55,000 square miles) which includes the districts of Bohemia and Moravia and neighbouring lands, including Slovakia and part of Silesia. Bohemia and Moravia have on three sides the natural frontiers of the Bohemian Forest, Ore Mountains, and Sudetes, while farther east the western Carpathians form the natural northern limit. The Czechs and Slovaks are kindred peoples, but the Czechs are more advanced in trade and arts. Bohemia and Moravia include the richest mineral and industrial districts which used to belong to the Austro-Hungarian empire. Bohemia is rich in coal, and many manufactures are carried on. Paper is made in the forest districts. The manufacture of fine glass, cottons, woollens, beer, and sugar are all important, and support a dense population. Coal is also found in Moravia, which is a great

woollen manufacturing region. Bohemia is chiefly drained north to the Elbe, on a tributary of which stands Prag, the capital.

Chekho-Slovakia touches the north bank of the Danube from Bratislava (Pressburg) down to Esztergom, about 80 miles, and includes and controls important lines of communication north and south from the Elbe, Oder, and Vistula valleys to the Danube, especially the Moravian Gate.

HUNGARY.

Hungary, reduced after the great war to 37,000 square miles, covers part of the middle courses of the Danube and the Tisza, and is almost entirely a plain country. The climate resembles that of Eastern rather than that of Central Europe. The chief wealth of Hungary is in its fertile soil. The Middle Danubian Plain, of which Hungary forms part, is one of the best wheat-growing lands in the world. The vine also is grown, and the Hungarian wines of Tokay on the Tisza are famous. The lower lands near the Danube have rich pasture, and horses are fed on them. These grass lands form the western end of the great steppe of South-eastern Europe. The capital of Hungary is Budapest on the Danube, a double city consisting of Buda on the high right bank and Pest on the flat left bank. Flour-milling is the most important industry.

RUMANIA.

Rumania (118,000 square miles) possesses (1) the south-eastern part of the Middle Danubian Plain, (2) the Lower Danubian or Wallachian Plain, on the north side of the river, (3) the Eastern Carpathians and Transylvanian Alps between the plains, (4) the foothills and lowlands of Moldavia and Bessarabia, east of the Carpathians, (5) the Dobruja, the country of low hills east and south of the lower Danube and its delta, bordering the Black Sea. The Lower Danubian Plain, like the middle, is a great wheat land, the grain being

carried down the Danube and shipped from Galatz at the head of the delta, and other ports, of which Constantsa in the Dobruja is the largest actually on the Black Sea coast. Forest products are important in the Carpathian and Transylvanian area. Cattle and sheep are kept in the hill pastures. The sunny slopes of the valleys are terraced for vines. There are important oil fields about Ploeshti in Wallachia, towards the hills not far north of Bukarest the capital, which is in the plain.

MEDITERRANEAN COUNTRIES: SPAIN AND PORTUGAL.

Physical maps of the Iberian peninsula, which contains the countries of Spain and Portugal, show how it differs from France in structure. Instead of extensive lowlands with a central highland, the greater part of the peninsula is occupied by a lofty plateau, called the Meseta, with only three considerable lowland areas. The lofty wall of the Pyrenees, rising in the highest peaks to over 11,000 feet, cuts it off from France. The scenery is extremely grand and rugged, with magnificent forests of oak and beech on the lower slopes. The Pyrenees are continued along the Bay of Biscay by the Cantabrian Mountains, rising steeply on their northern side, and sloping more gently on the south to the high plain of Castile which lies 3,000 feet above the sea. The Ebro, flowing from these mountains south-east to the sea, crosses the lowland of Aragon, which lies between the Pyrenees and the high north-eastern edge of the Meseta, called the Iberian Mountains. The Meseta, which slopes west to the Atlantic, is crossed by three long parallel rivers, which flow in gorges deeply sunk below the level of the plateau, and are useless for communication or navigation till they reach the lowlands near the sea on the west. They are the Douro, whose upper basin forms the lofty plains of Old Castile, the Tagus, separated from it by the Castilian Mountains, and the Guadiana, beyond which rises the southern margin of the

Meseta, called the Sierra Morena. South of the Meseta is the lowland plain of Andalusia, crossed by the Guadalquivir, with the Sierra Nevada on the south. The third lowland is in the south of Portugal, which consists of the lower basins of the Douro, Tagus, and Guadiana. (Area about 34,500 sq. miles.)

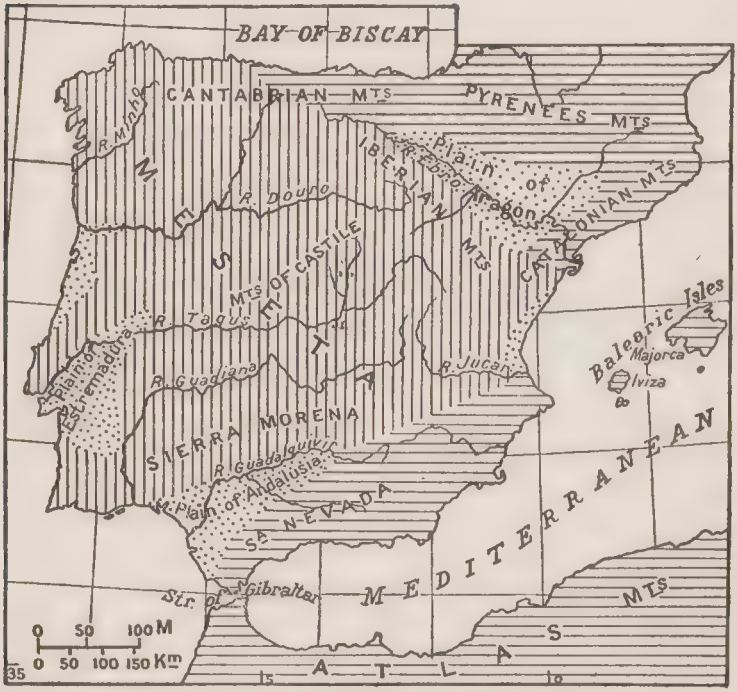


FIG. 83. Physical Divisions of Iberia.

The remainder of the Iberian peninsula is occupied by Spain. (Area about 191,000 sq. miles.)

Climate and Products. The climate of northern Spain differs greatly from that of the south. The north receives rain all the year round, the south has the Mediterranean climate with winter rains. The lofty mountains to the north prevent the moist Atlantic winds from reaching the interior,

which is one of the driest parts of Europe. The northern slopes of the northern mountains are forested, but the Meseta is bare. Sheep and goats are kept on the indifferent pastures it yields, and are driven to lower levels in autumn, as the winter on the high, exposed plateau is very severe. Agriculture is carried on in the lowlands, but irrigation is generally necessary, except in the north. This is difficult on the plateau, as the deep gorges of the rivers make their waters inaccessible, and the smaller rivers run dry in summer. Careful irrigation has made of Murcia and Valencia, the Mediterranean provinces of the east coast, veritable gardens, in which are grown olives and oranges, rice and sugar cane, while in one district the date palm ripens. Andalusia is less fertile than it would be if more care were devoted to irrigation. It is famous for its horses. In some districts of southern Spain and Portugal there are forests of evergreen oaks, in which large herds of swine are fed. The mineral wealth is considerable. The Cantabrian Mountains are rich in iron, which is exported to South Wales from Bilbao and Santander, and in coal. Copper and quicksilver are mined in the southern mountains, but mining, like agriculture, is less developed than it might be. The only manufacturing town of importance is Barcelona, on the north-east coast, which makes textiles, chiefly cotton. The vines produce wine, or their grapes are dried into raisins, which, with oranges and other Mediterranean fruits, are exported from Valencia and Malaga. The chief wine ports are Cadiz, exporting sherry, and Oporto, in Portugal, exporting port.

Towns. Lisbon, on the estuary of the Tagus, finely situated on hills above the river, is the capital of Portugal and an important port of call. The capital of Spain is Madrid, on a tributary of the Tagus, situated on a high bleak plain, nearly 2,500 feet above the sea. The other towns of importance, in addition to the ports already mentioned, are Zaragoza, in the Ebro valley, Seville, the capital of Andalusia, on the Guadalquivir, and Granada, on a tributary, at the foot

of the Sierra Nevada, with the famous palace of the Moorish kings called the Alhambra. Gibraltar, in the extreme south, a lofty rock nearly 1,400 feet high, connected with the mainland by a low isthmus, commands the strait of the same name where the Mediterranean is narrowed down to 9 miles, between the projection of the Spanish coast southwards and the projection of the African coast northwards. It is held by Britain, and is strongly fortified.

ITALY.

The map of Italy (area about 116,000 sq. miles) shows the long narrow structure of the peninsula (fig. 84). It is everywhere washed by the sea, except in the north, where it is cut off from Central Europe by the great horseshoe of the Alps. The lower parts of the Alpine valleys which are drained to the river Po and the Adriatic Sea are in Italian territory, including the lovely lakes of Maggiore, Como, and Garda, and the district of the Trentino, drained by the Adige, which until the end of the great war belonged to Austria. The only lowlands on the east are the plain of the Po, or Lombardy, which slopes from the west, opening in the east to the shallow head of the Adriatic Sea, and the lowland of Apulia in the south. The Apennines run through the middle of the peninsula from north to south. To the west of the Apennines lie the highland of Tuscany, drained to the west by the Arno, the plains round Rome drained by the Tiber, and the volcanic plains round Naples, separated by marshes from the Roman plain to the north. The remainder of the peninsula is occupied by mountains, which slope to the seas on either side.

Climate, Products, and Towns. The climate of the lower slopes of the Alps is more genial than that of the northern Swiss valleys. Many of the lower slopes are clothed in luxuriant woods of chestnuts. The vine is largely grown in these sunny valleys, and mulberry-trees feed the silkworm, the raw silk being manufactured in the plain below. This plain has on the whole a Mediterranean climate, though the

winters are severe. It is crossed by numerous streams from the Alps, which are used in many districts for irrigation, producing excellent pasture and agricultural land. Many famous cheeses are made, and poultry are largely reared for eggs, which are exported in large quantities. Rice is grown on the irrigated lands. Maize and other cereals are cultivated. The chief towns of the Lombard plain are Turin, in the west, at the termination of the Mont Cenis route across the Alps, Milan, at the termination of the St. Gothard route, a busy industrial town, and the centre of the silk manufacture of Northern Italy, Verona, at the end of the Brenner route, and Venice, a city of lagoons and islands, with canals for streets. Bologna in the south of the plain, at the foot of the Apennines, commands the chief routes across the mountains into Tuscany, by the valley of the Reno.

The Ligurian coast, or Italian Riviera, on the west is extremely beautiful, with richly wooded rocky shores overhanging the blue waters of the Mediterranean. The largest town is Genoa, the chief port of the Mediterranean, magnificently situated on a wide bay backed by hills. The direct railway routes across the Alps make it a great centre for trade between northern and southern Europe.

To the east of the plain of the Po, Italy possesses territory bordering the north-east shores of the Adriatic Sea, with the port of Trieste, important as an outlet for lands still further to the north-east—Austria, &c. (see p. 152).

The chief town of the Tuscan highland to the south of the plain of the Po is Florence, famous for its art treasures, situated on the Arno a little below where it leaves the Apennines. Tuscany is the land of the vine and olive, both of which are largely grown all over the Italian peninsula, though the olive does not ripen in Lombardy, where the winters are too cold. The trees of Tuscany and southern Italy are evergreen, the tall cypress and the bushy stone pine being the commonest.

South of Tuscany is the highland of Umbria drained by the

FIG. 84. Mountain Area, Plains, Rivers, and Towns of Italy.

XIII. Alpine pasture: upper limit of trees: snow-line

XIV. The Mont Cenis road

XV. Venice

XVI. Trans-Siberian Railway at Lake Baikal

upper Tiber, with many famous towns, built for the most part on the crests of the hills, the lower slopes of which are terraced for vines and olives.

Rome, the capital of Italy, lies in the plain of the lower Tiber, a few miles from the sea. It is situated on low hills, with beautiful views over the surrounding plain, or Campagna, to the wooded hills which enclose it. It contains the largest church in Europe, the cathedral of St. Peter, and innumerable smaller ones. These, like the numerous palaces, and particularly the Vatican, the residence of the Pope, contain priceless art treasures. Many ruins of the ancient city remain in the midst of modern streets.

Immediately south the country is marshy, but further south the plain on which Naples stands is one of the most fertile parts of Italy. The city lies on a magnificent bay, and above it towers the smoking cone of Vesuvius, an active volcano, whose eruptions do frequent damage. The lowland of Apulia, on the eastern side of the Apennines, slopes gradually to the sea. In addition to other Mediterranean products it grows a particularly hard wheat, which is made into maccaroni, chiefly at Naples. Brindisi and Taranto are ports of call for steamers passing through the Suez Canal on the way to the East, where they take up and set down the mails which are dispatched by the quicker routes overland. Calabria, the long western projection of Italy, is a thinly peopled mountain region, separated by the Strait of Messina from the island of Sicily.

Italian Islands. Sicily has an even more genial climate than the rest of Italy. Wheat and the vine are grown, and fruits, of which the orange and lemon are the most important. On irrigated lands many crops can be reaped in a year. The northern half of the island is occupied by a continuation of the Apennines of the peninsula. The volcano of Etna rises to the height of 10,000 feet in the east, above the town of Catania. The capital is Palermo on the northern coast. To the north of Sicily are the volcanic Lipari Islands, and to the south the small strongly fortified

island of Malta, a British naval station. Malta controls the routes between the East and West Mediterranean. Off the Tuscan coast is the small island of Elba. Further west lie the large mountainous islands of Corsica and Sardinia, the former belonging to France. Iron mining is important in Sardinia and Elba, and sulphur in Sicily. The other minerals are unimportant. No coal is found in Italy.

THE BALKAN LANDS.

The Physical Features of the Balkan Peninsula. The Balkan peninsula lies entirely south of the Danube. It is essentially a mountain land, continuously so in the west, which is occupied by the Dinaric and Albanian Mountains. These slope steeply to the eastern coast of the Adriatic Sea, the northern half of which is fringed with islands. This western mountain region is occupied mainly by Yugo-Slavia, with Albania. A set of parallel valleys open north to the Save and the Danube, the most important being the Morava. A similar set open south to the Aegean, a gulf of the Mediterranean, the most important being the Maritsa and the Vardar. The valleys of the Morava and the Vardar connect eastern Yugo-Slavia and Central Europe with the Aegean.

To the east of this furrow are five belts: (i) the plains of Bulgaria, (ii) the Balkan mountains, (iii) the upper Maritsa valley, (iv) the Rhodope Mountains, and (v) the Aegean coast, all running from west to east.

To the south the peninsula narrows greatly in Greece, but it is still mountainous. The extreme south is a peninsula in itself, of very irregular shape, called the Morea or Peloponnese, joined by the narrow isthmus of Corinth, which is crossed by a ship canal. The western coast of Albania and Greece is fringed by the Ionian Islands. The Aegean Sea, to the east of Greece, is thickly dotted with islands, forming an archipelago. The Balkan peninsula, in the east, brings Europe within a mile of Asia. Between the two is the Sea of Marmora, which narrows in the south to the Dardanelles, leading to the Aegean

Sea, which is a gulf of the Mediterranean, and in the north to the equally narrow Bosporus, leading to the Black Sea. Here is built Constantinople, holding the passage from Europe to Asia.

Climate and Products. The climate of the Balkan peninsula resembles that of eastern Europe in the north and east,

FIG. 85. Physical Features, Routes, and Towns of Balkan Peninsula.
(FIG. 86 in previous editions is cancelled.)

with cold winters and hot summers. The mountains of the west coast are extremely wet, but the rainfall diminishes to the east. On the western coast and in the narrower south the Mediterranean climate with mild winters prevails. In the north and centre the mountains are covered with forests of oak and beech. In the west and south these are replaced by the ever-

green trees of the Mediterranean, and olives, oranges, lemons, and figs come to perfection. Maize is the chief cereal in the Morava basin, and wheat in Bulgaria. The vine, tobacco, and mulberry for silkworms are widely grown. Orchards of plum trees cover large areas in the north. Roses are grown for making perfumes, especially in the Maritsa valley. In Greece figs are grown, and small grapes which are dried into currants. Pigs are kept in the beech forests, sheep, cattle, and goats everywhere on the higher pastures. The mineral wealth,

FIG. 87. The Situation of Constantinople.

though considerable, is little used, and manufactures do not exist, except in the form of peasant industries.

Yugo-Slavia. The kingdom of the Yugo-Slavs or South Slavs includes peoples called Slovenes in Carniola and neighbouring districts, Croats and Serbs in Croatia, Slavonia, Dalmatia, Bosnia, and Herzegovina, and Serbs in the former kingdom of Serbia. The name of Yugo-Slavia, though properly excluding Serbia, is used of the whole kingdom (area over 80,000 square miles). The greater part of this is a mountainous limestone country, rising to over 7,000 feet. The eastern mountains are densely forested. The country is very rugged, the rivers flowing in wild gorges. Coal and salt are abundant

and beginning to be mined; roads were made during the Austrian occupation, and such manufactures as paper from wood pulp are growing. Dried plums and timber are produced. Only few difficult railway routes lead to the ports on the bold Adriatic coast, which is largely sheltered by high islands.

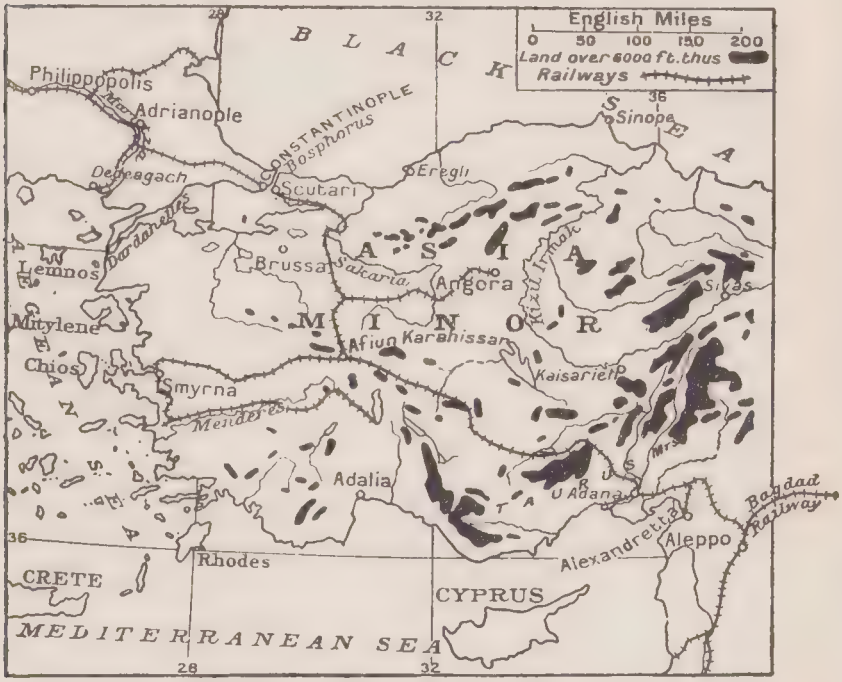


FIG. 88. The Routes from SE. Europe to Asia Minor.

Serbia is a highland country between the Dinaric Alps and the Balkans, sloping to the lowlands of the Morava and the Upper Vardar basins. Swine are fed in immense numbers in the oak and beech forests of the highlands, many sheep and cattle are kept, and the valleys are cultivated with cereals and fruits, especially plums. Coal and copper are found in the north-east. The capital is Belgrad, on hills opposite the confluence of the Save and the Danube.

Montenegro is a barren lofty limestone region, in which cattle-rearing is the chief occupation. The people are also Yugo-Slavs, but they are isolated among their mountains, and are proud and independent. The capital is Cettinye, on a plain not far from the sea but high above it.

Albania is a similar land farther south. The Albanians are descendants of a very old people, not Yugo-Slavs, wild inhabitants of a wild and mountainous country, difficult of access and till lately less known than any in Europe.

Bulgaria in the north slopes from the Balkans to the Danube, of which it forms the high right bank, on which are Rustchuk and other river ports. Varna and Burgas are the Black Sea ports. Wheat is grown in the north. Cattle, sheep, and goats are kept in the higher south. The capital is Sofia, on the Isker plain, south of the Balkans, a city of modern type. In the Maritsa lowland roses, cereals (including rice), plums, and vines are grown. Raw silk is an important product. The chief towns are Philippopolis and Adrianople on the Maritsa.

Turkey possesses in Europe its capital, Constantinople, and a small surrounding territory, but the rest of this state is across the Bosporus, in Asia.

Greece is a mountain-land of islands and peninsulas, with deeply-cut valleys and isolated plains. The summers are hot and dry, and vegetation becomes parched and withered. The west is wetter and more fertile than the east, producing large quantities of grapes which are dried as currants. The fig and olive are also grown. The capital is Athens, in a situation like that of Edinburgh. It is built round the base of a lofty rock, the summit of which is still crowned by the ruins of ancient temples, commanding the route between the lofty mountains behind and the sea in front. The climate and products of the Ionian and Aegean islands are similar to those of the mainland. The mountainous island of Crete is the most important of Greek islands.

Greece extends into the south of the Vardar basin (Mace-

donia), where Salonica, built to the east of the delta, is the chief city and a great port. To the east, along the northern shore of the Aegean, is a narrow coastal lowland without good ports, but some trade in tobacco and other products.

The Routes across the Balkans are controlled by the physical features. The railway connexion from Central and Western Europe, running by Belgrad, goes up the Morava valley. It divides at Nish. One branch goes farther up the Morava and down the Vardar to Salonica, and thence on to Athens and other Greek towns. The other runs upwards over the hills to Sofia, and again over hills to the upper Maritsa valley, which it follows to Adrianople and then goes on to Constantinople. The railway is continued on the other side of the Bosporus across Asia Minor, and has connexions to Mesopotamia, Syria, Palestine, Arabia, and Egypt.

THE RUSSIAN LANDS.

The Russian lands (area about 2,000,000 square miles) occupy the eastern plain of Europe. All this territory used to be part of the Russian Empire, but it contains a number of different peoples. The most numerous are the Great Russians of the centre, north, and east. In the north-west along the Gulf of Bothnia, north of the Gulf of Finland, are the Finns, with their relatives the Karelians in the north, in the Archangel district. South of the Gulf of Finland, along the Baltic coast, are the Esthonians (related to the Finns) and the Letts and Lithuanians, kindred peoples, in Esthonia, Latvia (Livonia and Courland), and Lithuania. South of them and east of Poland are the White Russians, a backward peasantry living in a poor marshy territory. South again, extending from the northern Carpathians to the river Dnieper, are the Ukrainians or Little Russians: their land includes most of the rich 'black earth' region, and many live in Galicia and neighbouring lands, where they are called Ruthenians. In the Crimea, and in Taurida to the north of it, and between the middle Volga and the southern Urals, there are Tatars.

About the river Don and in the Caucasus region there are Cossacks, and in the Caucasus region also there are Tatars, Russians, and various mountain tribes. In addition to the revolutionary Bolshevik government with its centre at Moscow, these peoples have set up, or tried to set up, new States, but the boundaries are unsettled.

Relief of the Land. Hardly any of the surface is over 1,000 feet in height, except in the Urals. Trace the line dividing the waters flowing to the Arctic Ocean and the Baltic Sea from those flowing to the Black and Caspian Seas. It runs from the Carpathians to the middle of the Urals. The rivers draining the shorter northern slope flow across the pine-wooded lowlands of Northern Russia, which pass in the extreme north into tundra.

The Dvina Basin. The Northern Dvina, the longest, flows to the White Sea, with the port of Archangel on a low flat, on the right bank of the estuary. This port, which is icebound in winter, is the oldest of the Russian ports, and was long the only one. The inhabitants of the lower basin of the Dvina, and of the Pechora, to the east, are mainly engaged in preparing train oil from the Arctic fisheries, pitch, tar, and deals from the forests, and in trading in tallow, skins, and furs. The peninsula of Kola and Russian Lapland, to the north-west of the White Sea, is thinly populated by fishermen, hunters, and reindeer breeders. But there is a port on the Bay of Kola, on the Murmansk coast, with a railway from the south.

The Baltic Lake District. To the south, along the east coast of the Baltic, is the lake region of Finland (compare Fenland), one-third of whose surface consists of water. The rest of the country is covered by pine forests. The capital is Helsingfors, on the Gulf of Finland.

Lakes Ladoga and Onega, the largest in this Baltic Lake district, lie to the south-east of Finland, and are drained by the Neva, at the mouth of which stands the city of Leningrad, better known to us by its former name of Petrograd, protected by the island fortress of Kronstadt. Though built on piles in the Neva swamps Leningrad has broad quays, great

public buildings, and the immense cathedral of St. Isaac, with burnished domes and cupolas, brightly coloured as in all Russian churches. Leningrad stands at the head of the Gulf of Finland, on the south shore of which is Reval, the chief town of Esthonia, which borders the gulf here. To the south again, bordering the Gulf of Riga, is Latvia (Livonia). The Western Dvina flows across the Baltic Heights to the Gulf of Riga through a land of lakes and pine forests, in the clearings of which rye, flax, and hemp are grown, while the forests supply timber, masts, pitch, and tar for export. The port of Riga, at the mouth of the Dvina, is the capital of Latvia, a picturesque old town, the many spires of which are visible miles out at sea.

Courland (chief town, Mitava) lies south of the Gulf of Riga, and south again, bordering the detached eastern part of Germany and Poland, is Lithuania. A large part of this country is in the basin of the river Niemen, or Memel, on a tributary of which stands the chief town, Vilna. The Memel enters the Baltic through the lagoon of the Kurisches Haff, with the port of Memel at the mouth.

The northern parts of the basins of the rivers draining the longer southern slope of the great Russian plain are still in the woodland. Towns are few, and chiefly at the meeting-point of routes. (See fig. 89.)

The Volga Basin. The chief river is the Volga, the longest river in Europe. Its basin forms more than half of Central Russia. Look at fig. 89, trace its course and measure its length. It rises in the low Valdai Hills, about 600 feet above the sea, and its course is everywhere extremely slow. It flows south-east across the woodland. Its tributary, the Oka, which is the longer and larger of the two rivers at their confluence, rises much further south. It flows first north and then east, draining the coal-field round Tula, a town with iron and steel works. On a tributary is Moscow, in the centre of Russia, on a height in the forest clearing, where many routes meet. On this height is built the fortress of the Kremlin, a collection of barracks, palaces, and churches, with their

FIG. 89. Rivers, Towns, and Routes of Eastern Europe.

innumerable glittering, many coloured domes, forming one of the most picturesque groups of buildings in the world. Moscow has cotton and other factories. Nizhni Novgorod, at the confluence of the Oka and Volga, is built partly on a similar Kremlin Hill and partly on the plain below, on which a great fair is annually held. The Volga now turns east, flowing between a high right bank, rising in places to 1,000 feet, and a low left bank. A mile or two from the river on the left is Kazan, built round and up a Kremlin Hill, rising above the plain, which is under water when the river is full. A little lower, also on the left bank, is the confluence of the Kama, flowing from the base of the Urals, which are rich in minerals, past Perm, in the centre of a great mining region. Below the confluence the river flows south. Notice in the map the curious bend it makes in passing round a range of hills 1,000 feet in height, with Samara at the end of the bend. This is the chief town of the Tatar-Bashkir country, which extends east of the river to the Ural hills. Samara is a river port, and an important station where the line running from Moscow east to the Siberian railway crosses the river. Numerous granaries and innumerable windmills show that the river has entered one of the great wheat districts of Southern Russia. Saratov, with numerous bright domes and many windmills, is finely situated on the high right bank of the river, which is here three miles wide. Immense steppes extend on both sides of the river in its lower course, stretching on the east far across Asia. The Volga enters the Caspian by a great delta. Notice that this sea has no outlet to the ocean, but forms what is called a basin of inland drainage. Astrakhan, at the mouth, is built on one of the numerous islands formed by its distributaries. It is the chief port of the Caspian, and a centre of the important sturgeon fisheries of the Lower Volga.

The Don, to the west of the Volga, flows in its lower course across the steppe lands of the Don Cossacks' country to the Sea of Azov, which opens by the Strait of Kerch into the Black Sea. Novocherkask and Rostov, on the lower Don, are the

chief towns of this territory. West of the Sea of Azov is the peninsula of the Crimea, which with the neighbouring mainland forms the territory of Taurida. The chief town is Simferopol, in the Crimea. To the west of the Don is the Don and Donets coal-field, the busiest town of which is Kharkov, with brewing, engineering, and other industries. The longer Dnieper, west of the Don, runs in the forest area, and has a very similar course. It flows past the ancient city of Kiev, built on an amphitheatre of wooded hills on the right bank. Kiev is the chief town of the territory of Ukrainia or the Ukraine, through the centre of which the Dnieper flows. Kherson at the mouth is an important port, but less so than Odessa, the chief centre of the Black Sea trade, built on a cliff rising above the stormy Black Sea. It trades in all the produce of the steppes. At the foot of the Carpathians in the Ukrainian country petroleum is found.

To the north of the Ukraine, and south of Lithuania, is the territory of the White Russians (chief town, Minsk), backward peasants. The land is inhospitable, with wide marshes about the river Pripet in the south.

Climate and Products. The climate of the Russian lands, as we have already seen, is one of extremes, with very severe winters, especially in the north and east. Look back at the maps in figs. 57, 58. Little rain falls, and that chiefly in summer. The differences of climate in this vast plain are expressed by well-marked zones. In the north is the bleak tundra, passing to the south into stunted woodlands. These become magnificent forests of evergreens further south, varied by oak and beech towards the centre. About one-third of the Russian lands in Europe is forest. On the southern edge of the forest the trees appear in clumps, forming an open wooded country. The soil consists of rich black earth, forming some of the finest agricultural land in the world. Farther south are the steppes, or treeless grass-lands, in the better parts of which are grown immense quantities of wheat for export, and of rye for home consumption. To the south the steppes become

drier and sandier, with scanty vegetation, where stock can be kept only in the better parts. Along the Caspian and Aral Seas they form sandy wastes, once covered by the waters of these seas. In the Crimea, which is sheltered by hills in the north from the cold winds of the steppe, the climate and products are like those of the Mediterranean lands.

Agriculture, forest industries, and the keeping of animals in the steppes are more important than manufactures. Many factory hands work only in winter, returning to the country in summer.

(For the territories of the Caucasus see p. 191, and for Siberia and other Russian lands in Asia, p. 194.)

ASIA

Position. The mainland stretches from the equator to within 12° of the Pole, or including the islands on the continental shelf from 10° S. To the west it is bounded by Europe, the Black Sea, the Mediterranean, and the Red Sea, the latter separating it from the continent of Africa. It stretches east through 154°, to 170° W., where it is less than 40 miles from

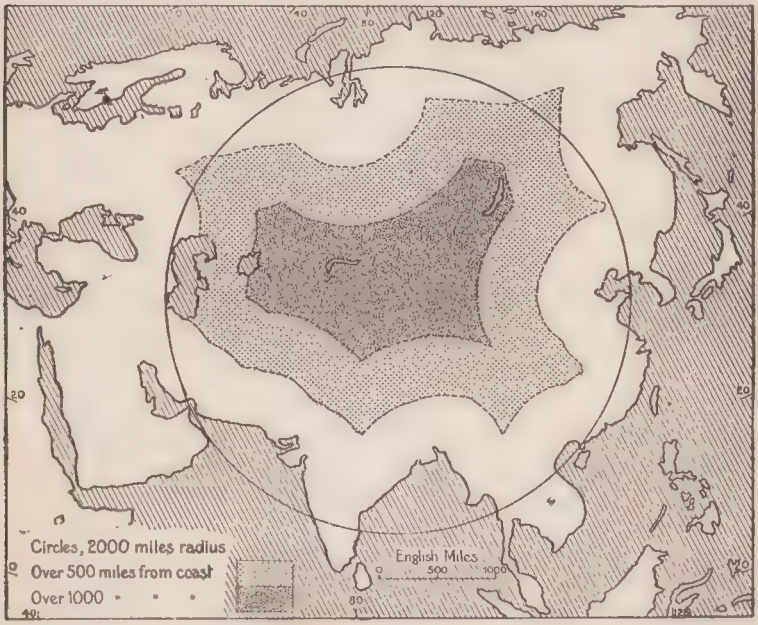


FIG. 90. Map of Asia showing Distances from the Coast.

the American coast. Its area is about 17,000,000 square miles, or between four and five times that of Europe.

Seas, Gulfs, Peninsulas, Islands. The greater part of the continent is a compact mass lying between the tropic of Cancer and 70° N. (see figs. 90, 92). Three great peninsulas, Arabia, the Deccan or India, and Indo-China project on the south into the Indian Ocean, and are separated by its gulfs,

the Arabian Sea between Arabia and India, and the Bay of Bengal between India and Indo-China. Notice the almost landlocked Persian Gulf, between the eastern coast of Arabia and the mainland. On the east coast a fringe of islands and peninsulas enclose four seas. These are the South China Sea, enclosed by the East Indian Islands, Sumatra, Java, Borneo and Celebes, and the Sunda, Molucca, and Philippine Islands; the East China Sea, enclosed by Formosa, and the Lu Chu Islands; the Sea of Japan, by the Japanese Islands; and the Sea of Okhotsk, by the Kurile Islands and the Kamchatka peninsula.

Relief. Look at the map in fig. 91 showing the relief. Lines are drawn at 600 feet below sea-level, and at 600 feet, 3,000 feet, and 6,000 feet above sea-level. Notice that about a quarter of Asia is less than 600 feet above sea-level, and that by far the greater part of these lowlands are in the north and west. The highlands form the remainder of the continent, with smaller lowlands round the lower courses of the rivers. About one-twelfth of the continent is over 10,000 feet above sea-level.

We may divide Asia into five belts:

(1) The Northern Lowland.
(2) The Central Mountains, with their marginal lowlands.
(3) The Southern Tablelands.
(4) The Eastern Highlands.
(5) The Eastern Volcanic Chain.

The Northern Lowland is continuous with the Great Plain of Europe. The two continents form one vast continent, which is often called Eurasia. The Northern Lowland of Asia and the Plain of Europe form the Eurasian Lowland.

The Northern Lowland is broadest in the west, and narrows towards the east. In the south and east it rises to the Central Mountains and the Eastern Highlands. It consists of the plain of Turan in the south-west, and of the Siberian Lowland in the north.

Turan, the south-west corner of the Northern Lowland, is

drained by the Amu Daria, or Oxus, and the Syr Daria, not to any ocean but to a depression in the centre, the Sea of Aral, a basin of inland drainage like the Caspian. To the south and east it is bounded by the lofty walls of the Hindu Kush, the Pamirs, and the Tian-shan, or

FIG. 91. Physical Features of Asia.

Celestial Mountains. In the north-east it is separated by low heights from the Siberian Lowland. Turan consists partly of steppe, and partly of sandy desert, with fertile valleys.

The Siberian Lowland consists of three parts. In the west it is a low, flat, swampy plain, drained by the Ob and its tributaries to the Arctic Ocean. The eastern and higher part forms

a low platform drained by the Yenisei and the Lena to the same ocean. East of the Lena are the North-eastern Lowlands, enclosed by the Verkhoyansk and Stanovoi Mountains, which form part of the Eastern Highlands. (See fig. 93.)

The Northern Lowland is like north Europe in general character. Along the Arctic Ocean extends the tundra, where

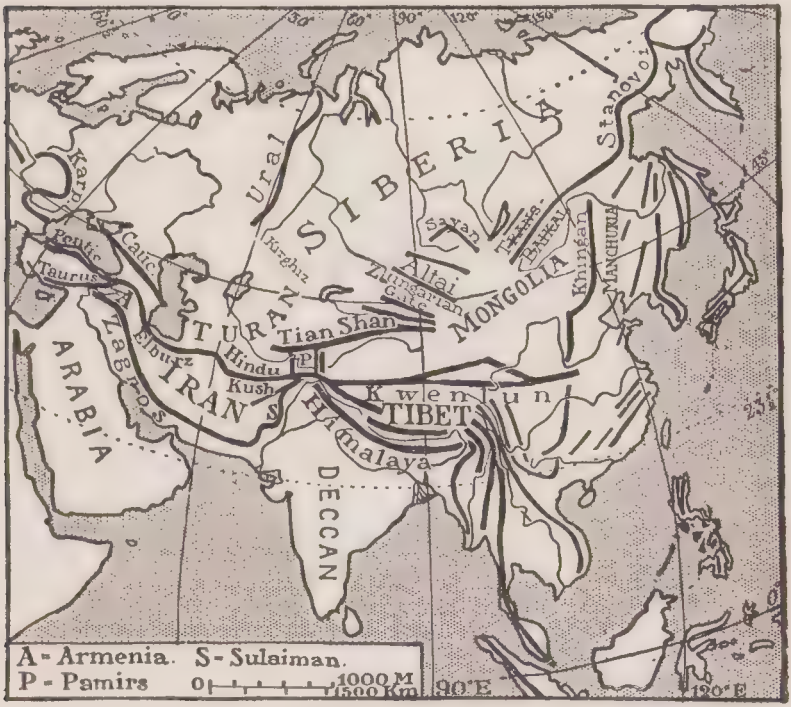


FIG. 92. Key to Physical Features shown in Fig. 91.

in spring the rivers melt, and flood the surrounding country, adding to its desolation. South of the tundra are the forests, coniferous in the north, and mixed with deciduous woods in the south. South of the forest zone, or taiga, as it is called in Siberia, are steppe lands, passing into desert in Turan.

The Central Mountains are the largest and loftiest mass of highlands in the world. They are a continuation of the high-

lands of Europe. They widen out from west to east, where they occupy the entire centre of the continent. Three chains or groups, running from west to east, can be distinguished. The northern chain is represented by the Caucasus and the Tian-shan. The central chain, which is the best marked, includes the Pontic Mountains, the Elburz range, the Hindu Kush, the Pamirs, and the Kwenlun Mountains. Between the northern and central chains lie a series of depressions, the Black and Caspian Seas in the west, and the Tarim basin, enclosed between the Tian-shan and the Kwenlun, in the east. The

FIG. 93. The Northern Lowlands of Asia.

southern chain is represented by the Taurus, the Zagros and Sulaiman Mountains, and the mighty Himalayas. Between the central and southern chains lie the plateaus of Asia Minor, Iran, and Tibet. In the Armenian Highlands and the Pamirs these three chains are brought close together, by the narrowing of the mountain belt (fig. 94, and compare with 91).

Most of these mountain systems consist of many ranges, with plateaus and valleys between. The Caucasus resembles parts of the Alps, but with occasional cones of extinct volcanoes, the highest of which, Elbruz, rises to over 18,000 feet.

Its lower slopes are covered with beech forest, with grassy pastures above. The Tian-shan, by no means the longest range in the Central Mountains, extends for a distance as great as that from London to Petrograd. Its northern slopes fall steeply to the lowlands of Turan and Western Siberia, its southern slopes equally steeply to the Tarim basin. Many of its peaks are above the snow line, and its glaciers and snow-fields are very extensive. They feed the Amu and Syr Daria, the former rising in the Pamirs. Their upper courses flow first in magnificent gorges and then through

FIG. 94. Physical Features of Northern India and Tibet.

fertile mountain valleys, sinking at last to the plain of Turan, over which they flow with gradually diminishing volume to the Aral Sea. The scenery of the Central Chain is very varied. Its many ranges differ in height, steepness, breadth, and in the rocks of which they are composed. In the Armenian Highlands rise the Euphrates and Tigris, flowing through wild gorges to the lowland of Mesopotamia. The Hindu Kush is a broad and lofty system, which forms the southern wall of the gorge of the upper Amu. The most imposing of all the mountains of Asia are the Himalayas, which rise steeply above the lowlands at their southern base. From the plains

they look like a wall of forest, crowned with peaks of eternal snow. Everything we know of mountain scenery is here seen on a gigantic scale. The forests are more impenetrable, the snow peaks more dazzlingly beautiful, the glaciers vaster, the precipices more stupendous, the gorges sheerer and more profound, the roaring rivers which rush through them, between walls thousands of feet in height, more terrific in strength and volume than anywhere else in the world. By forest, gorge

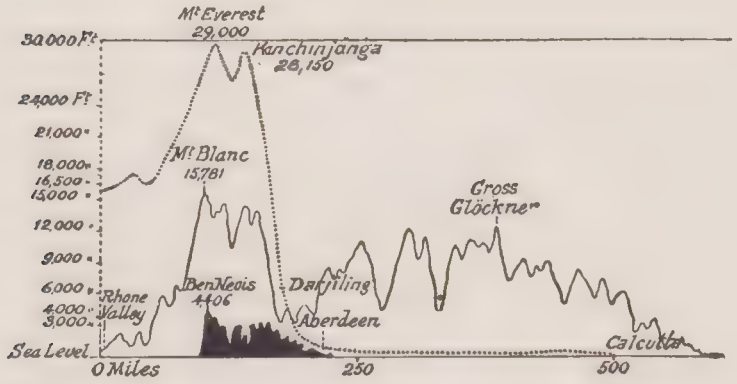


FIG. 95. Comparative Height and Breadth of Himalayas, Alps, and Scottish Highlands.

and precipice, piled like a giant staircase from three to four miles high, they climb to the passes leading to the plateau of Tibet, above which their snowy peaks rise a mile or two higher still (fig. 94). Mount Everest, the highest mountain in the world, is 29,000 feet, or nearly six miles in height (fig. 95). No foot has yet reached it, and the way is barred by peaks almost equally colossal. Many great rivers rise in the glaciers of the Himalayas, and break through the mountains in stupendous gorges and defiles, which in places are quite inaccessible. The Indus gathers up the waters of the western Himalayas, and flows south to the Arabian Sea. The Ganges with its many tributaries collects the waters of the Central Himalayas, entering the Bay of Bengal by a vast swampy delta, where it is

joined by the third river, the Brahmaputra, which has found its way over the plateau of Tibet, and round the eastern margin. At the eastern edge of the plateau of Tibet the mountains turn south, and break up into the parallel ranges of Indo-China, separated by densely forested gorges, in which the rivers Irawadi, Salwin, Mekong and others flow south to the sea. The glaciers of Eastern Tibet give birth to the Hwang-ho and the Yang-tse-kiang. Their upper courses are

FIG. 96. Syria, Mesopotamia, and Northern Arabia.

in wild and little-known gorges, their middle courses cross the Eastern Highlands, and their lower courses form the fertile lowlands of China.

The plateaus of Asia Minor, Iran and Tibet, are all rugged lands, above whose surface rise many mountains. The valleys, though often steep are fertile, especially in Asia Minor, and Iran. Even in Tibet, which lies nearly three miles above the level of the sea, there are a few valleys where agriculture

is possible. Much of the area of all these plateaus, however, is fit only for poor pasture.

South of the Central Mountains are the marginal lowlands,

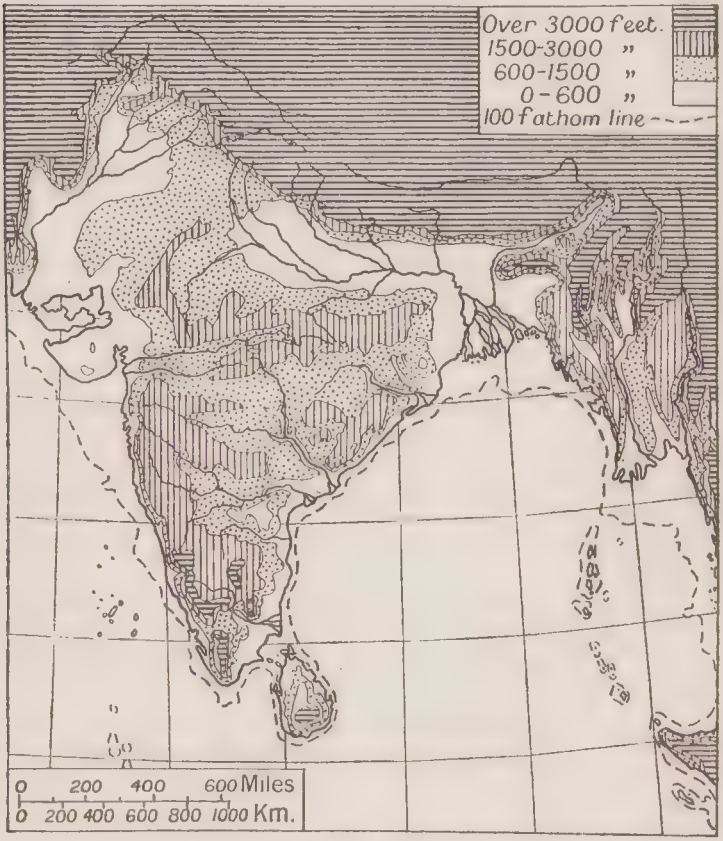


FIG. 97. Physical Features of India.

varying from a mere strip along the coast, as in Asia Minor and Iran, to broad and fertile plains round the lower courses of the rivers. Look at fig. 96 and find the plain of Mesopotamia,

consisting of the lower basins of the Euphrates and Tigris, flowing to the Persian Gulf; the plain of Hindustan, formed by the lower basins of the Indus and the Ganges, walled in by the Sulaiman, Hindu Kush and Himalaya Mountains; the plain of Burma round the lower Irawadi; the plain of Siam round the lower Menam; and the plain of Cambodia round the

FIG. 98. Rivers and Canals of India.

lower Mekong. These lowlands are extraordinarily fertile. In the plains of Mesopotamia and Hindustan irrigation is necessary, but the rivers supply abundant water for this purpose.

South of these lowlands lie the **Southern Tablelands**, Arabia and the Deccan.

Arabia is separated from Africa by the rift of the Red Sea,

at the head of which is the narrow isthmus of Suez, connecting the two continents. It is a tableland, highest in the west and sloping eastwards to the Persian Gulf. The western part is covered with poor pasture, broken up by deep, steep, fertile valleys. Further east are sandy deserts, with isolated fertile spots known as oases (fig. 96). A narrow strip of sandy

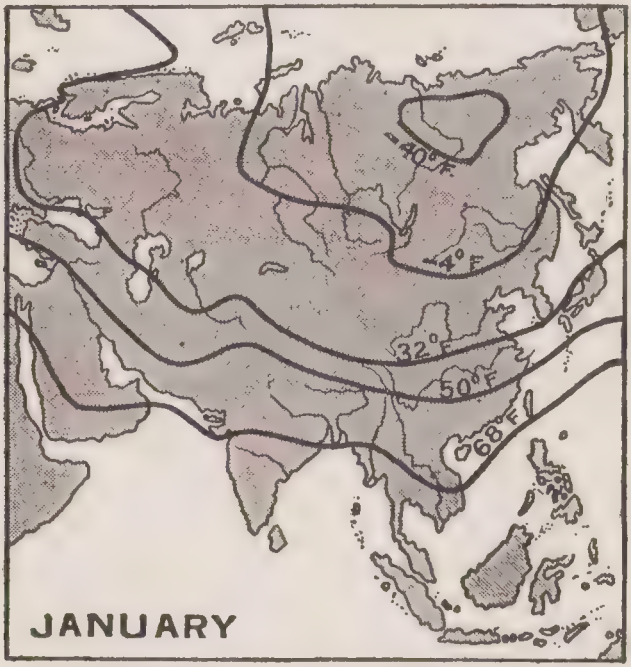


FIG. 99. Mean Temperature in January reduced to sea-level.

infertile lowland borders the tableland, widening in the east to the Mesopotamian plain.

The tableland of the Deccan lies south of the plain of Hindustan. It also is highest in the west, where its margin, rising steeply above the narrow coastal lowland, is known as the Western Ghats, or Steps (fig. 97). Its southern end forms the Nilgiri Hills. It slopes to the east, and most of its rivers, such as the Godavari and Krishna, flow in that direction to

the Bay of Bengal, except the Narbada and Tapti, in the north-west, which flow west (figs. 97 and 98). To the south, separated by the shallow Palk Strait, is the island of Ceylon, low in the north, but mountainous in the south.

The **Eastern Highlands** are much older and less lofty than the Central Mountains, to which they bear the same relation

FIG. 100. Mean Temperature in July reduced to sea-level.

as the Central European Highlands bear to the Alps. The long narrow Lake Baikal separates the Sayan and Altai mountains to the west, from the Yablonoi, or Trans-Baikal Highlands to the east. To the south is the Mongolian plateau, composed of deserts and poor steppes, stretching to the base of the Central Mountains. The eastern edge of this plateau forms the Khingan Mountains, overlooking the lowland of Manchuria drained by the Amur, and the North

China Highlands, overlooking the plain of North China. To the south of this plain are the extensive South China Highlands, between Tibet and the Sea.

The Eastern Volcanic Chain runs through Kamchatka, the Kurile Islands, Japan, the Lu Chu Islands and the Philippines. It is characterized by fertile soil, deep valleys and steep conical

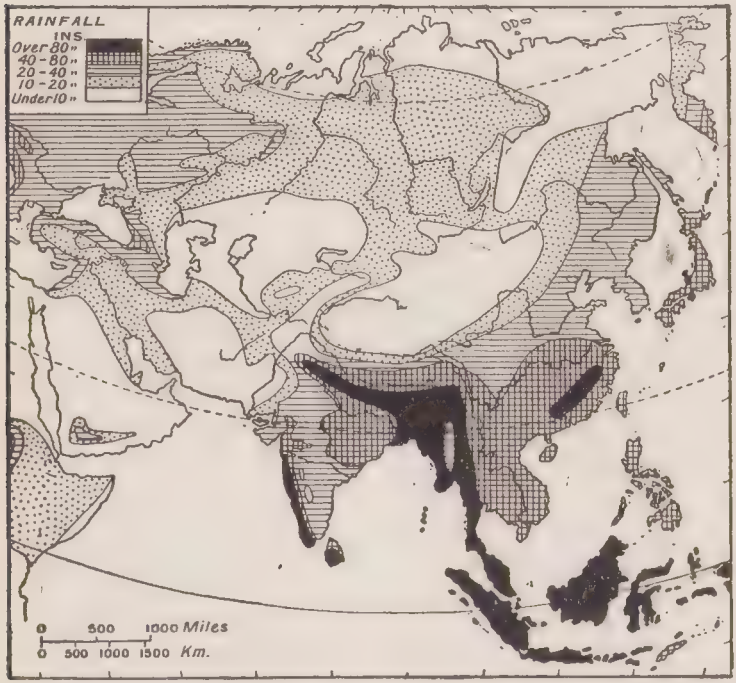


FIG. 101. Mean Annual Rainfall of Asia.

mountains, of which Fujiyama, the sacred mountain of Japan, is the most perfect. Earthquakes are common.

Climate. Two circumstances combine to make the climate of Asia very varied. The first is its great extension from north to south, the extreme north being within the Arctic Circle, the extreme south quite near the equator. The second is its great difference of elevation, which varies from sea-level

to the summit of Mount Everest, nearly six miles higher.

Over most of Asia the climate is marked by great extremes. We saw in Europe the influence of the ocean in rendering climate equable. In Asia the land mass is much more compact. Look at the diagram in fig. 90. It shows a circle whose centre is the west of the Mongolian plateau,

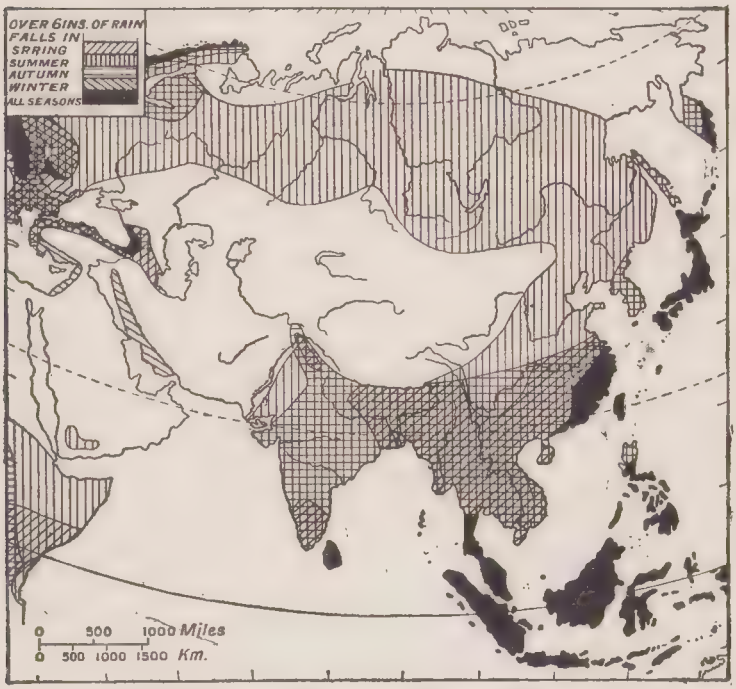


FIG. 102. Seasonal Distribution of Rainfall in Asia.

and whose radius is 2,000 miles in length. Notice that this circle includes almost no sea. The same diagram shows how great a proportion of the continent is over 500 miles from the sea, while the interior is over 1,500 miles from it. A very small proportion of the continent, therefore, is rendered equable by the neighbourhood of the sea.

Look at the map in fig. 99 and notice how large an area of

the land is under the freezing point in January, and now only the south, and south-east are free from frost. Notice on the other hand in the map in fig. 100 that in July the greater part of the lowlands in the interior are at least as warm as the Mediterranean, and that only the extreme north and the high mountain areas have low temperatures.

Now look at the rainfall map in fig. 101. Notice that only the margin of the continent from Kamchatka to the Deccan and a narrow strip round the Mediterranean has over 20 inches rainfall. Two-thirds of the continent receives very little rain. In winter the winds blow out from the land to the ocean, so that little rain falls at that season except round the Mediterranean, and on the north-east coast, north of Korea, where winter storms occur. In summer, except in the Mediterranean, the winds blow in from the sea, bringing rain from the ocean, so that summer is the wetter season. As the seas lie to the south and east most of their moisture is intercepted by the lofty mountains of these regions and very little reaches the interior. Only in the northern lowlands, where there are no high mountains, is there a belt of rainfall across the interior of the continent.

The winds of the Indian Ocean are called Monsoons. They blow outward from the north-east in winter, which is the dry season, and inwards, from the south-west, in summer, which is the wet season. The same name is often given to the outflowing and inflowing winds of eastern Asia (see fig. 111).

Natural Regions of Asia. We may group the lands of Asia, according to their climate, vegetation, and products, as the Mediterranean lands, the Siberian lands, the Desert lands, and the Monsoon lands. The political divisions are shown in fig. 103.

The Mediterranean Lands. These stretch from the Mediterranean to the plateau of Iran. They include Asia Minor, Syria, Palestine, Mesopotamia, Armenia, and other districts south of the Caucasus. All have the Mediterranean

climate with warm, dry summers, mild winters and winter rains, but the heat increases rapidly to the south and away from the sea, and the rainfall diminishes (see figs. 104, 105). It is therefore difficult to draw the line between the Mediterranean and the desert lands. The products belong to the Mediterranean

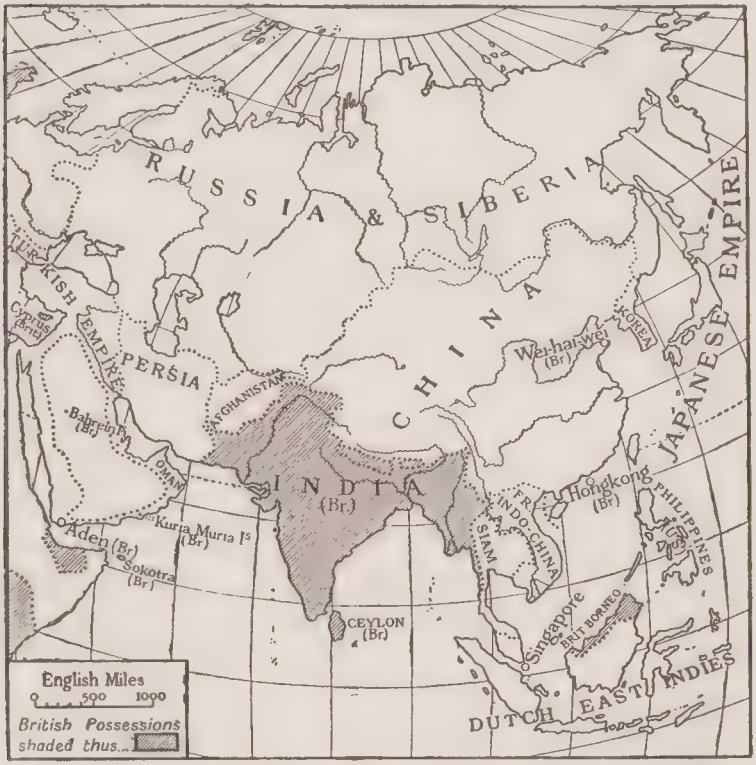


FIG. 103. Political Divisions of Asia. The British possessions are shaded.

type. The cereals include barley, wheat, maize, and millets. The vine is extensively grown round the Mediterranean for raisins, but inland becomes less important than the fig, pomegranate, peach, and apricot. The mulberry is extensively cultivated as a shade tree and for silk-worms, and cotton, tobacco, and the opium poppy are largely grown. The date-

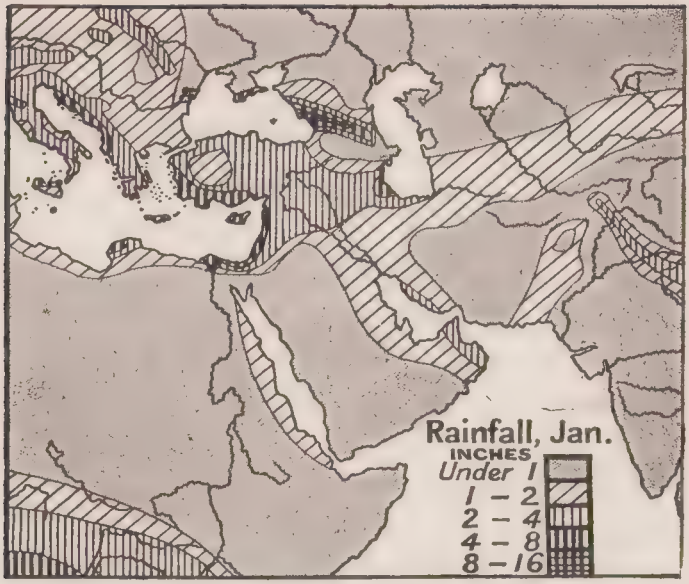


FIG. 104. Rainfall in January.

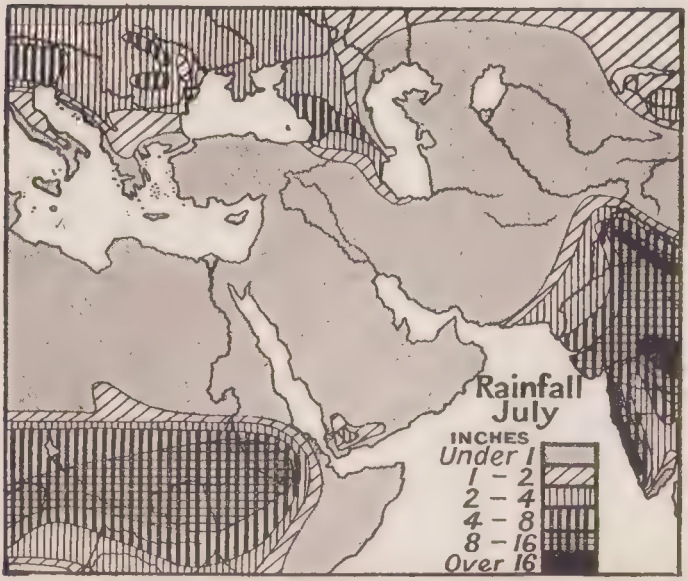


FIG. 105. Rainfall in July.

palm becomes important towards the desert edge. Irrigation is necessary everywhere. Camels, goats, and sheep are kept on the plateaus and in the highlands, and the manufacture of rugs and carpets is a flourishing industry.

Caucasus. The district south of the Caucasus, or Transcaucasia (including the territory of Georgia) has been most fully developed. It includes the forested slopes of the

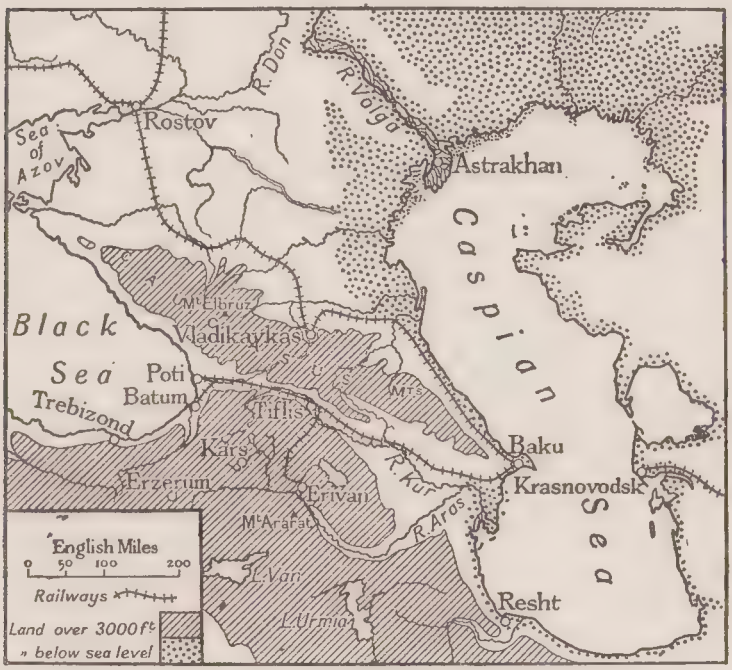


FIG. 106. Caucasia.

Caucasus, the valleys with their vineyards, orchards, and fields of maize, cotton, and tobacco, the minerals of the Caucasus, and in particular the deposits of petroleum around the Caspian. The centre of the petroleum region is Baku, on the Caspian. Its busiest suburb is expressively called Black Town. The capital of the province is Tiflis, on the precipitous cliffs of the Kur river. A railway connects Baku with Batum

on the Black Sea, through the magnificent forested gorge of the Rion, with the lowlands cleared for maize. At every station are long sidings filled with trucks of oil tanks, so important is this industry to the province.

Asia Minor; Syria; Tigris-Euphrates Basin. These lands, in contrast with Transcaucasia, have long been neglected. Irri-

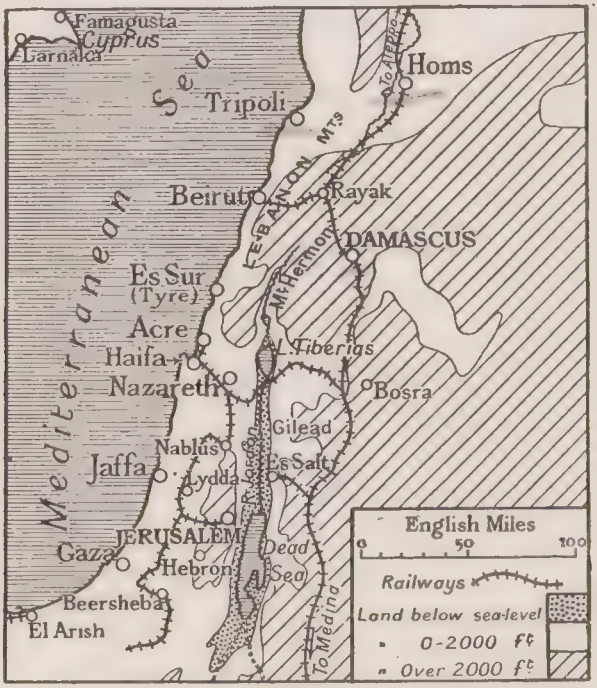


FIG. 107. Palestine.

gation is backward, and tracts which might produce rich crops are allowed to serve for poor pasture. Railways are extending, but much of the trade is done by camel caravan. On the Black Sea the chief port is Trebizond. To the south are the highlands of Armenia and Kurdistan, with Erzerum as the largest town. Smyrna, on the Aegean, exports fruits, cotton, opium, figs, carpets, sponges, &c. Syria, to the south,

cotton, opium, figs, carpets, sponges, &c. Syria, to the south, with Palestine, and its capital Jerusalem, are poorly cultivated and thinly peopled. The oranges of Jaffa are celebrated, and tobacco and silk are important. The capital is Damascus, an important centre of caravan trade, connected by rail, across

FIG. 108. Towns and Territorial Divisions of SW. Asia.

the Lebanon range, with Beirut, on the Mediterranean. Aleppo, farther north, is a great meeting-place of routes, on the shortest route from the Mediterranean to Mesopotamia, once the granary of Asia, which fell into decay through the ruin of its irrigation system. Wandering tribes of herdsmen and robbers form the scanty population of what should

be a garden, and may again be one. It is included in the new Arab state of Irak. The dates of the lower Tigris and the Persian Gulf are exported from Basra. The chief towns are Mosul and Baghdad, both on the Tigris, which is navigable for river steamers to the latter town (see fig. 96).

Persia. Persia (area about 630,000 sq. miles) resembles the Turkish provinces, but a greater proportion of the surface is salt or sand desert. The villages are chiefly in the mountain valleys, and the arid plains are thinly peopled. Water is brought for many miles in underground channels and wherever it comes it brings fertility. Communication is by mule or camel caravan, while Persian horses are famous. Roads are bad, and railways few. The capital is Teheran, at the foot of the Elburz mountains. The other towns are Tabriz and Resht, in the north-west, Ispahan and Shiraz, in the centre, and Bushire on the Persian Gulf.

Cyprus, in the Mediterranean, resembling Asia Minor in climate and products, is administered by Britain.

The Siberian Lands. The Siberian lands (area nearly 5,000,000 sq. miles), the great northern lowland of Asia, have all the varieties of climate of Eastern Europe, but in a more extreme form, and with less rainfall, owing to their greater distance from the sea. They are in fact an extension of Eastern Europe, as the Urals do not form a complete boundary. Their tundra, forests or taiga, steppes, and deserts are a continuation of the same zones in Russia.

The resources of Siberia, though far from fully developed, are very great. Its forests supply all kinds of forest produce, and form the greatest fur preserve in the world. In the Urals and the Eastern Highlands the mineral wealth is great. In the lands south of the forest enormous harvests of wheat are grown in the rich black earth. In the steppes flocks and herds support a nomadic population, and supply sheepskin and felt, from the sheep, leather and saddlery, from oxen and horses, camels' hair cloth, rugs, carpets, tallow, &c. The margin of the desert of Turan (area about 1,500,000 sq. miles)

is being brought under cultivation, and in the oases of Khiva, Merv, Bokhara, Samarkand, Tashkent, Khojent, and Khokand, cotton and the fruits and cereals of hot countries ripen.

The chief towns of Siberia are Omsk, and Tomsk on tributaries of the Ob, and Irkutsk near Lake Baikal. These are towns which combine streets impassable from mud, with the fine buildings, and the luxuries and conveniences of European cities. A transcontinental railway, the Trans-Siberian line, runs from Europe and Russia across the steppes to Omsk, the 'capital of the steppes,' and thence through the forest past

FIG. 109. Towns and Routes of Russian Asia.

Krasnoyarsk, on the Yenisei, to Irkutsk, the chief town of Siberia. The line runs south of the lake, and one branch crosses the highlands to the east, and continues across Manchuria to the Pacific, which is reached at Vladivostok, on the sea of Japan, while a southern line passes by Mukden to Port Arthur, and to Peking, &c. Another branch runs north of the river Amur and east of its tributary the Ussuri, also ending at Vladivostok. The Amur is navigable; its chief ports are Blagovestchensk and Khabarovsk.

The towns of Turan, situated on the oases of the same name already mentioned, are connected by the Trans-Caspian line, which runs to Khokand, at the foot of the Tian-shan.

From Khojent it connects through Tashkent with Orenburg, and the European lines (see fig. 109).

The Desert Lands. The desert lands are of two kinds, the cold and the hot. The cold deserts lie either in the far north, in the Siberian tundra, or at great elevations, as in **Tibet** (area about 738,000 sq. miles) which forms part of the Chinese empire (fig. 94). The greater part of this plateau consists of snow-fields and tundra-like wastes, but in a few sheltered valleys barley and fruits ripen in the hot summer. The chief occupation outside these valleys is the keeping of yaks, a kind of ox, which can cross passes too high for any other animals. The capital is Lhasa, in a fertile valley.

The hot deserts stretch from Arabia, through Persia (including Turan to the north, and Afghanistan to the east), the Tarim depression, and Mongolia, almost to the Pacific. In the deserts of the interior the climate is very extreme, winters being extremely cold. Where irrigation is possible fertile oases can be created, where cotton, cereals and fruit can be grown.

Arabia (area about 1,400,000 sq. miles) is fertile only in the west and south, where perennial mountain streams make irrigation possible. Coffee and dates are the most valuable agricultural products, and the horse and camel the most valuable animals. Mecca, Medina, and the port of Mokha at the south of the Red Sea are the chief among the few towns. Aden, a barren volcanic peninsula at the southern entrance to the Red Sea, is a British coaling station, and a key to the route to India. The remainder of Arabia is divided among small Arab states and tribes. In the south-east is the port of Muscat (see fig. 108).

Afghanistan. Afghanistan (area about 250,000 sq. miles) is a land of bleak mountains and deep valleys, with a very extreme climate. The valleys permit a scanty agriculture, when irrigated. Elsewhere a poor pasture affords grazing for animals. The camel is the principal transport animal.

The chief towns are Herat, in a fertile valley, and Kabul, which commands the route into India by the Khaibar Pass.

Chinese Turkestan. The deserts of the Tarim, or Chinese Turkestan, and Mongolia, form part of the Chinese Lands. They are walled in by mountains, at the base of which are oases. The rest is poor steppe or sandy desert. In the west **Kashgar** and Yarkand are important towns. In the east the oases are small and the towns unimportant.

The Monsoon Lands. These have dry winters (very cold in the north, warm in the south), and hot summers with a well-marked rainy season. Irrigation is carried to great perfection in India and China, enabling arid regions to be cultivated and both winter and summer crops to be raised. Rice, grown in flooded fields, is a very important crop, forming along with millet the staple food of the people. Maize, wheat, and other cereals, pulses, oil-seeds, and sugar are the most widely cultivated products. Tea, which needs hot summers, abundant showers, and good drainage, is grown on the hill slopes of Japan, China, India and Ceylon, and Java. Of fibre-yielding plants the most important are cotton, which is grown throughout the monsoon lands, and jute, cultivated in the lower Ganges basin. The forests, which cover large areas, especially in Indo-China, provide hard timbers, teak being the most valuable, fancy woods such as ebony, lacquer, and wax trees, and other valuable products. In the lowlands of the Ganges delta, and of Indo-China, in parts of which the rainfall is enormous, the forests become dense and rank, forming wet jungles, with an almost impenetrable tangle of tropical plants. In these forests live the tiger, elephant, huge apes, and other animals, never seen in the forests of the north. The buffalo becomes an important draught animal, especially in India.

In the south are (1) the Indian Empire, including the plain of Hindustan, the Deccan peninsula with Ceylon, and the western part of the Indo-Chinese peninsula, (2) the independent kingdom of Siam, (3) French Indo-China, occupying

most of the peninsula east of Siam, (4) the Malay archipelago. In the east are the Chinese Lands, excluding Tibet and Mongolia, the Japanese province Cho-sen, occupying the peninsula of Korea, and the island empire of Japan (see fig. 103).

India. India, or Hindustan (area about 1,500,000 sq. miles) has great varieties of surface and climate (figs. 97, 104, 105, 110, 111). In the north are the Himalayas, in which the chief state is Kashmir, with its capital, Srinagar, situated on a beautiful lake, surrounded with snow peaks. The lower slopes of the Himalayas are densely forested, and at their base is a strip of unhealthy jungle, known as the Terai. In the east tea is largely grown on the hills of Assam, in the forest

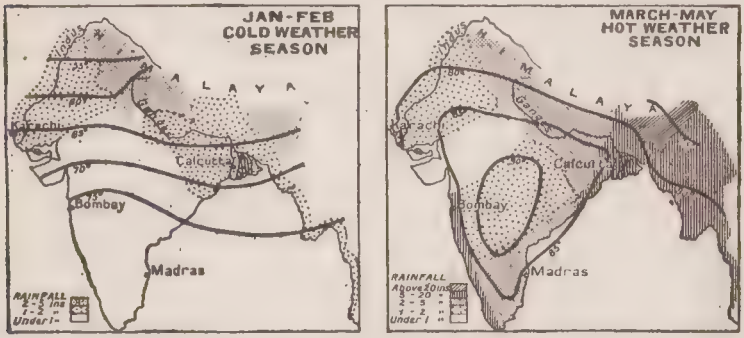


FIG. 110. Temperature and Rainfall of India in the first five months of the year.

clearings. The mountains of the north-west frontier are much bleaker, and share the arid nature of the surrounding countries. From the Himalayas the rivers descend in gorges of the wildest character to the plains below, where their waters are gathered up by the Indus and its great tributary the Sutlej in the west, and by the Ganges and its tributaries in the east. The east and west of the plain of Hindustan differ considerably in climate. The south-east monsoon brings abundant rains to most of the Ganges basin, though it is occasionally late, or scanty. When this occurs over a series of years scarcity or actual famine results. In the west the rainfall is much less copious, and south of the

Indus desert conditions are found in the desert of Rajputana (figs. 110, 111). Irrigation is necessary throughout the plain, in the west because of the scanty rainfall, in the east rather

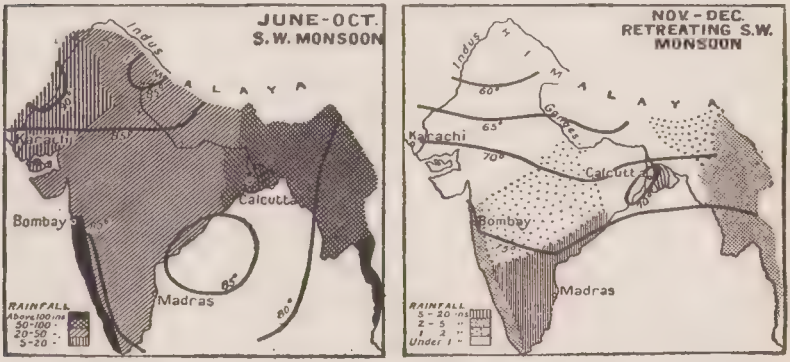


FIG. 111. Temperature and Rainfall of India in the last seven months of the year.

because of its uncertainty. With its aid both winter and summer crops can be grown. Immense sums of money have been spent in constructing irrigation canals which distribute

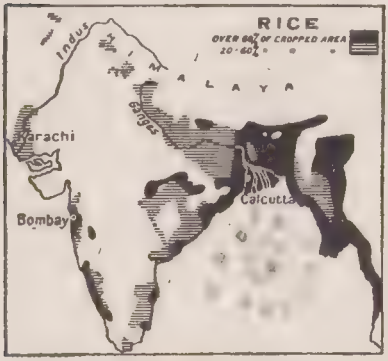


FIG. 112. Distribution of Rice in India.

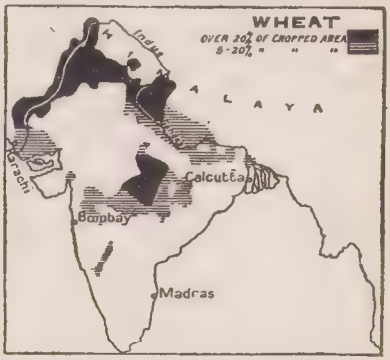


FIG. 113. Distribution of Wheat in India.

the waters of the rivers over the plain. Nearly three-quarters of the population are engaged in agriculture. Wheat is grown in the cooler north as a winter crop (fig. 113). Millets, pulses, and oil seeds, of which linseed is perhaps the most important,

are universally cultivated. The opium poppy is grown in the Ganges valley, but its cultivation here, as everywhere else in India, is decreasing. Rice is grown in Bengal and other areas (fig. 112), and indigo round the Ganges and in the Punjab, or district about the five chief tributaries of the Indus. Manufactures are increasing in Bombay, Bengal, Bihar, and Orissa, and a large area west of the Ganges delta bids fair to

FIG. 114. Railways of India.

become a great iron and steel producing district; but the hand industries, carried on as hereditary trades, are still important. The best known of these are the fine carpets, muslins, and silks for which India has long been noted.

The most famous cities of India lie on the Ganges and its tributaries, a proof that this has always been the richest part of the country, and the most frequented route across it. Delhi, Agra, Lucknow, Allahabad, Benares, all contain

magnificent buildings of great splendour and antiquity. The capital of all India is Delhi on the Jumna. Calcutta, the capital of Bengal, on the Hugli, is the outlet for one of the richest and most densely peopled regions in the world (see fig. 116). The Indus, which flows through a more arid country, has hardly any cities of note, except Karachi, the port which exports the wheat of the north-west, and Lahore and Multan in the Punjab. A network of railways covers the plain of Hindustan, the chief running from Calcutta north-west to Peshawar, at the mouth of the Khaibar route from Afghanistan (see fig. 114). Only a few are shown on the map.

The tableland of the Deccan has hotter winters than the north, and a more uncertain rainfall, particularly in the centre, where the failure of the south-west monsoon means famine. The Deccan is the great cotton growing area of India, and the cotton manufacture is very important in Bombay on the coastal plain of the west (fig. 115). Millets and pulses are staple crops. Few railways cross the tableland, and the rivers are difficult of navigation. For all these reasons it is less densely populated than the plains to the north. The chief towns are Bombay, on the west coast, Madras on the east, the capitals of presidencies of the same name, Haidarabad (or Hyderabad), in the centre of the tableland, the capital of the native state of Haidarabad, and Poona, below the inner edge of the Ghats, south-east of Bombay.

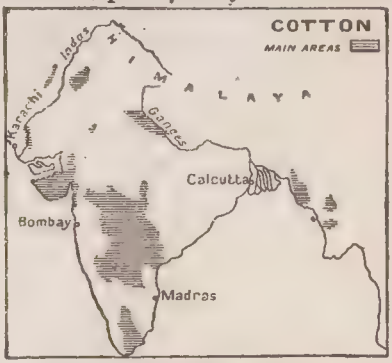


FIG. 115. Distribution of Cotton in India.

The most densely peopled parts of India are the coastal plains and the Ganges basin (see fig. 116). The political divisions are shown in fig. 117, and the states under native rulers in fig. 118.

Burma. Burma (area about 168,000 sq. miles) is politically

part of India. It is a land of forests and jungles, which yield valuable timbers, especially teak. Rice is largely grown in the lowlands. Its mineral wealth consists of coal and petroleum. The capital is Rangoon, on the Irawadi. Moulmein, at the mouth of the Salwin, is the other chief port. Mandalay, on the Irawadi, is the most important inland town.

Ceylon. Ceylon (area about 25,000 square miles), to the south of India, is flat in the north and mountainous in the

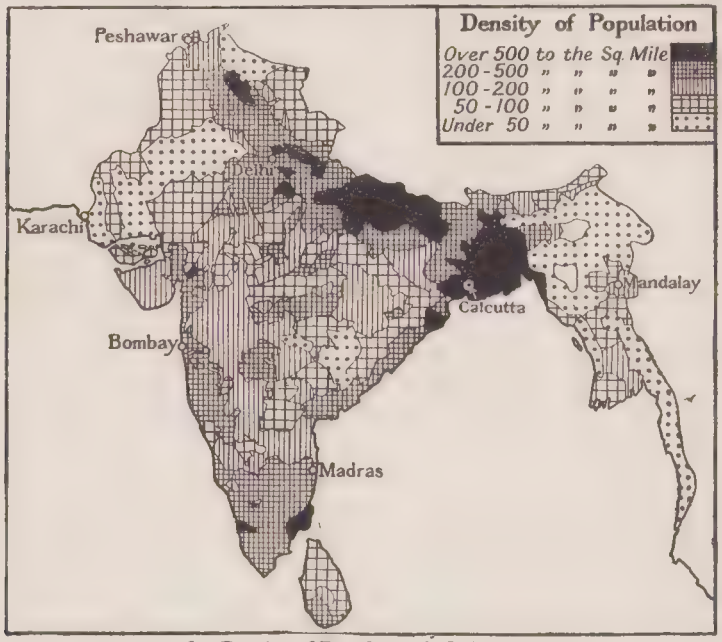


FIG. 116. Density of Population in India and Ceylon.

south. Coco-nuts, rice, tea, cinchona, and plumbago are important products. The chief towns are Colombo, on the west coast, and Kandy in the interior.

Indo-China. Indo-China is a land of forested mountains and swampy lowlands. Rice is the chief crop. Indigo is becoming important in French Indo-China. The products of the luxuriant tropical forests include gutta-percha, rubber, cacao, pepper, &c. Bangkok is the capital of the kingdom of Siam (area about

200,000 sq. miles) (see fig. 119). The chief towns of French Indo-China (area about 257,000 sq. miles) are Saigon in the south, Hue, in the centre, and Hanoi in the north. The long narrow mountainous densely-forested south-western peninsula forms the Malay peninsula, the southern part of which is British. Its tin mines are the richest in the world. To the south is

FIG. 117. Political Divisions of India and Surrounding Lands.

the island of Singapore, also British, one of the great shipping and trading centres of the east.

The Malay Archipelago. In the Malay archipelago Sumatra, Java, and the smaller Sunda Islands continue the line of the Malay peninsula. To the north lie Borneo and Celebes, and the Moluccas, or Spice Islands, with the Philippine archipelago, east of the South China Sea. The latter belongs to the United States. The rest of the islands form the Dutch East

Indies, except northern Borneo, which is British, and a scrap of Portuguese territory in Timor. Java is by far the most important island. A chain of volcanoes runs through it, and the lower slopes and plains are wonderfully fertile. Sugar, coffee, tea, rice, indigo, cinchona, rubber, and teak are principal products: other islands yield also spices (Moluccas), copra, petroleum, coal (Sumatra, &c.), and tin. The capital is

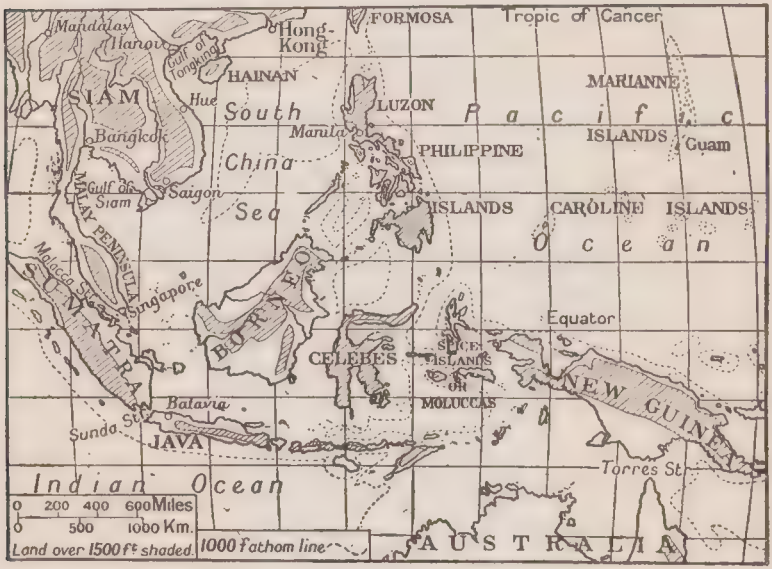


FIG. 118. The Malay Archipelago.

Batavia in Java. Luzon, the largest of the Philippines, produces sugar, copra, tobacco, and a fibre called Manila hemp, from Manila, the capital and chief port.

China. The monsoon lands of China are the lowland of Manchuria, the central plain, and the southern highlands. The winters are cold, even in the south; the summer rainfall generally plentiful. Manchuria is fertile but thinly peopled, though towns have risen along the railway. Beans, millets, cereals, fruits, and medicinal plants, such as ginseng, are grown. The capital is Mukden, in the south, with the port

of Niuchwang. Port Arthur, with the port of Tairen, is a terminus of the Siberian line.

The Northern Plain of China is covered with a rich but thirsty yellow soil called loess, which makes irrigation necessary even where the rainfall would be ample for less porous soils. Millets and cereals are the chief crops. The mineral

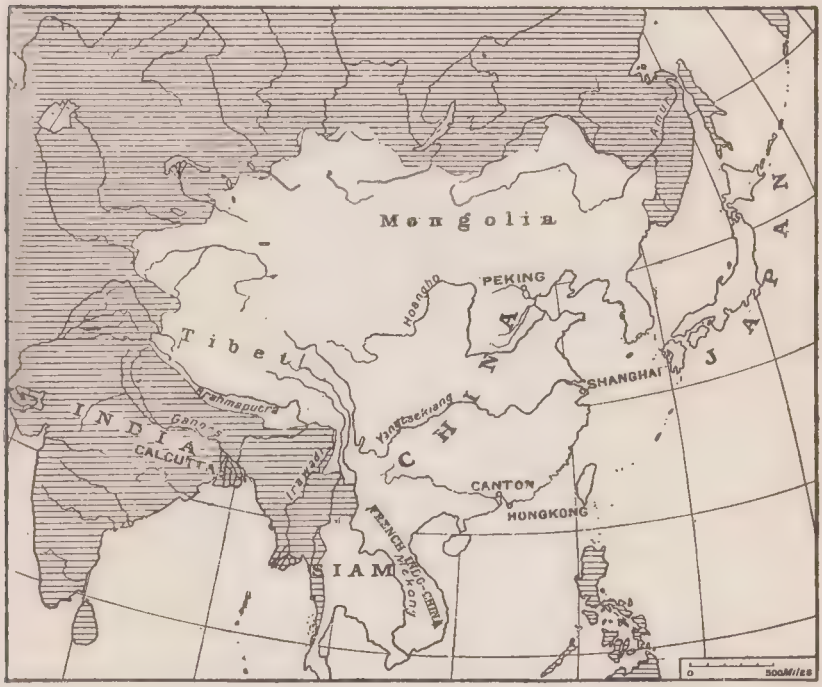


FIG. 119. The Far East.

wealth, particularly coal, is enormous, in the bordering hills, and as it occurs near densely populated parts of the country, manufactures may develop in the future (figs. 120, 121). The Hwang-ho, the chief river of Northern China, is not navigable, and has an uncertain course through the loose soil. Its banks are higher than the surrounding plain, and it frequently breaks through the embankments which restrain it, flooding vast areas, and destroying thousands of lives.

The capital is Peking, in the north, with Tientsin as its port, but it may be changed to Nanking.

Southern China is more varied in surface than North China. Much of it consists of a fertile red soil, which can be cultivated to a great height in the mountain valleys. The largest river is the Yangtse-kiang, which flows through one of the richest regions of China. Tea is grown on the hill slopes,

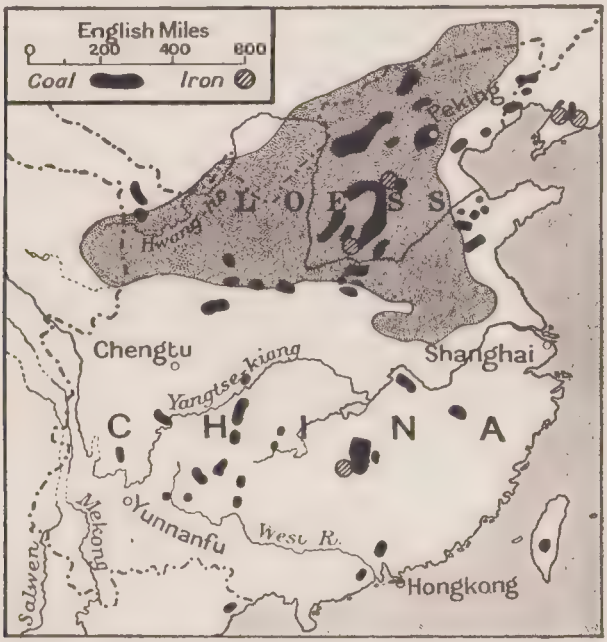


FIG. 120. Coal and Iron in China.

and opium, cereals, silk, tobacco, coal, salt, and iron are the other chief products. Many populous towns, such as Hankow, lie on the Yangtse, which is navigable for ocean steamers to the Ichang gorge, 1,000 miles from the sea. Shanghai, near its mouth, is one of the busiest ports in the East. The basin of the Si-kiang to the south, is hotter and wetter, and rice is largely grown in the lowlands. The mulberry is important

in the highlands, and silk is a valuable product. Minerals are abundant in the basins of both the Si and the Yangtse. Canton, near the mouth of the Si, is chief among many ports which export the produce of this rich region. Hong-kong, an island at the mouth of the Si, is a great British port.

Tibet and Mongolia, pp. 196, 197, are included in the Chinese Lands (area about 4,278,000 sq. miles).

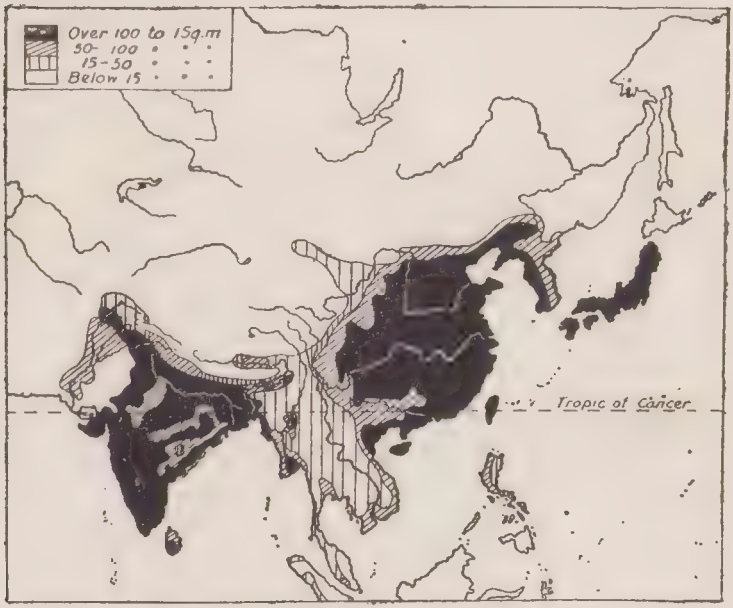


FIG. 121. Population of Eastern Asia.

Korea. Korea (area about 82,000 sq. miles) is a mountainous peninsula, sloping steeply to the ocean, and covered with forest. Its resources are very undeveloped, but its mineral wealth is known to be great. The valleys and plains of the longer western slope are planted with rice and maize in the south, and with temperate cereals and pulses in the north. The capital is Seoul, some distance from the sea, with Chemulpho as its port. Korea (Cho-sen) is now Japanese.

Japan. Japan (area about 148,000 sq. miles) consists of four large volcanic islands and several small ones (see fig. 123). The northern island of Yezo is a hilly forested land, with coal and other minerals, and rich fisheries. The capital is Hakodate. Honshiu, the most important island, contains several active and some extinct volcanoes, including the beautiful Fujiyama, represented in almost every Japanese picture. The forests

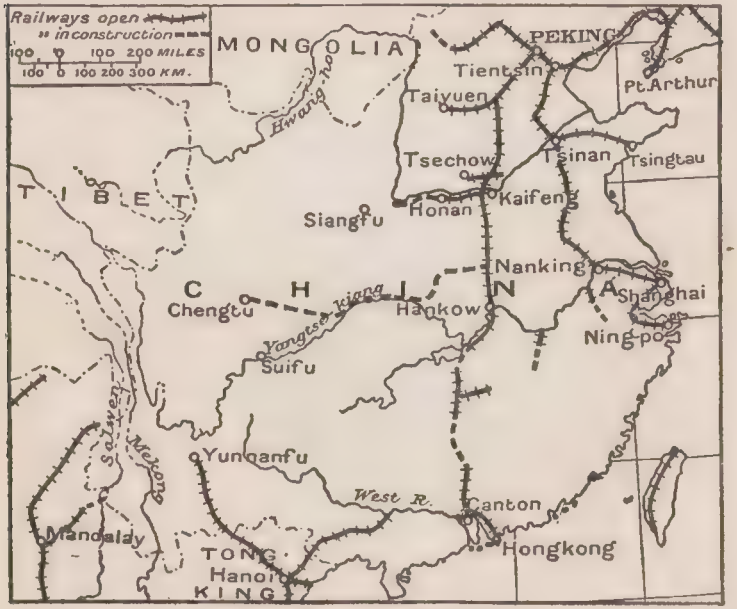


FIG. 122. Chief Railways of China.

produce valuable timber, including the lacquer tree. On the lower slopes are cultivated tea and mulberries. The valleys and flooded plains are planted with rice and other cereals, pulses, and fruit trees. The capital is Tokyo, on the bay of the same name, with Yokohama as its port, the centre of a great foreign trade. Both were almost destroyed by a terrible earthquake in 1923. The old capital is Kyoto, to the west, on Lake Biwa. Not far away, on the shores of the beautiful island-studded Inland Sea, is Ozaka, a city of canals and factory chimneys, engaged in ship-building and cotton manufacturing. Kobe is the chief port of this important

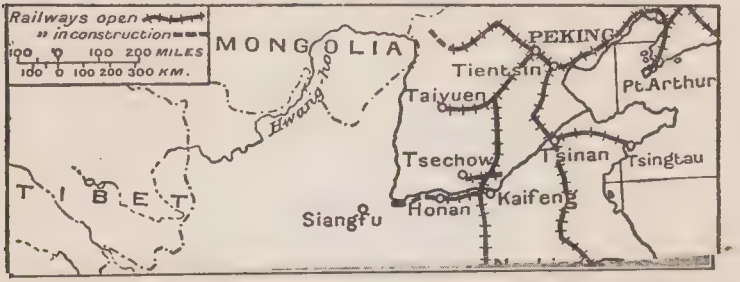
industrial region. To the south of the Inland Sea are the islands of Shikoku and Kiushiu, the latter with a rich coal-field near Nagasaki, its chief town and port, on a magnificent harbour. Formosa (area about 14,000 sq. miles), off the coast of China, nearly a thousand miles to the south, is a forested mountain land, producing camphor in the highlands, and tea on the lower hills.

Peoples of Asia. The races of Asia are very varied. They were formerly classed as (1) the Caucasian or White Race, inhabiting Asia Minor, Arabia, [illegible] Afghanistan and the

XVII. Aden

XVIII. The Coast of Ceylon

Japan. Japan (area about 148,000 sq. miles) consists of four large volcanic islands and several small ones (see fig. 123). The northern island of Yezo is a hilly forested land, with coal and other minerals, and rich fisheries. The capital is Hakodate. Honshiu, the most important island, contains several active and some extinct volcanoes, including the beautiful Fujiyama, represented in almost every Japanese picture. The forests



XIX. Chinese houseboats on the Yangtse-Kiang

XX. The Niger near Jebba

industrial region. To the south of the Inland Sea are the islands of Shikoku and Kiushiu, the latter with a rich coal-field near Nagasaki, its chief town and port, on a magnificent harbour. Formosa (area about 14,000 sq. miles), off the coast of China, nearly a thousand miles to the south, is a forested mountain land, producing camphor in the highlands, and tea on the lower hills.

FIG. 123. Physical Features of Japan. *Note that the lowest land is shaded.*

Peoples of Asia. The races of Asia are very varied. They were formerly classed as (1) the Caucasian or White Race, inhabiting Asia Minor, Arabia, Persia, Afghanistan, and the northern part of India, (2) the Malay, or Brown Race, occupying much of Indo-China, and the Malay archipelago, (3) the Mongolian, or Yellow Race, occupying the remaining and far greater part of the continent. If this classification is limited to the languages spoken, it is no doubt nearly correct. The peoples are at every stage of culture, from the highly civilized races of India, China and Japan, to the wild tribes inhabiting the forests of the south-eastern peninsulas and islands. Many religions are professed, the most important being Mohammedanism, which extends eastward from the Mediterranean into India, China, and the Malay peninsula and archipelago, and Buddhism, which extends north and east from India into Tibet, Siberia, China, and Japan. Hinduism

is peculiar to India, Confucianism to China, and Shintoism to Japan, existing side by side with the other religions named. Christianity is the religion of the white conquerors. Various forms of heathenism are practised by the uncivilized tribes of the forest and tundra.

The entire population of Asia is supposed to be about 850 millions, or more than half of the human race. Nearly nine-tenths of the people live in the monsoon lands where the highest civilizations have developed. The steppes contain most of the remaining tenth. The hot and cold deserts are the most thinly populated part of the continent.

AFRICA

Position. Look at the map in fig. 125. Notice that the mainland of Africa forms a vast peninsula, stretching between 35°N., and 35° S. The continent is bisected by the equator and crossed by both tropics. Owing to the great reduction

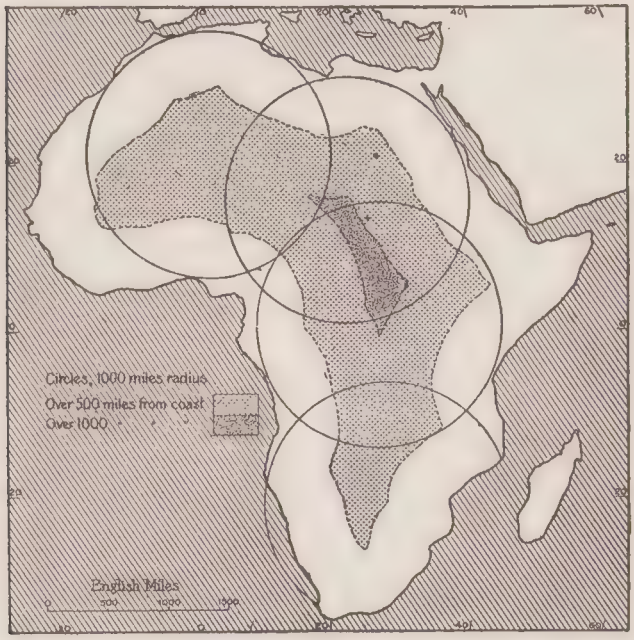


FIG. 124. Map of Africa showing Distances from the Sea.

in its breadth at about 4°N. by far the greater part of the land mass lies north of the equator. The area is 11,500,000 sq. miles, about three times that of Europe.

Seas, Gulfs, Islands. Africa is united to Eurasia by the narrow isthmus of Suez. On the north it is bounded by the Mediterranean, on the west and south by the Atlantic, on the

east by the Indian Ocean and the narrow rift of the Red Sea, separating it from Asia. Relatively to the size of Asia the Mediterranean, which narrows to a few miles in width at the Strait of Gibraltar, and the Red Sea are of trifling size, and exert little influence on the climate of the continent.

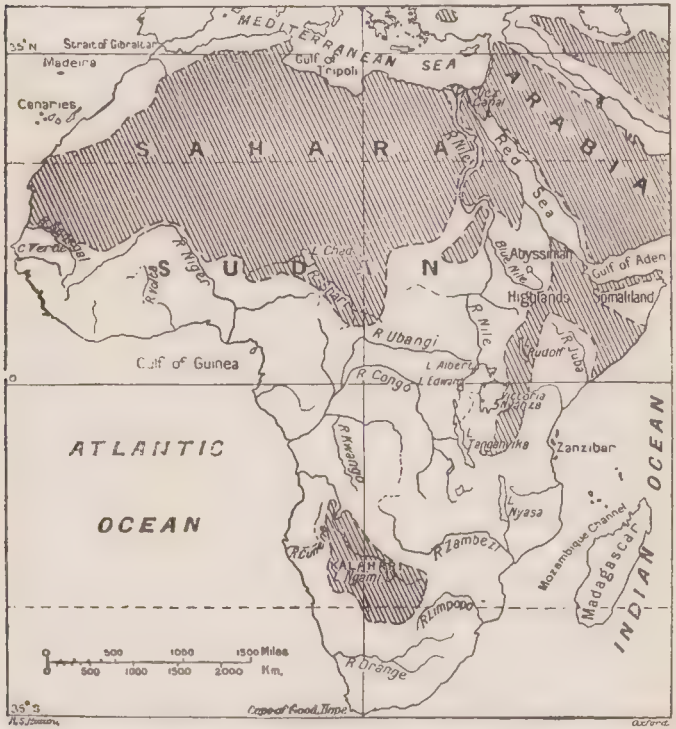


FIG. 125. Rivers, Lakes, and Inland Drainage Areas of Africa. The areas which are not drained to the sea are shaded.

Notice the extreme compactness of Africa, and the absence of peninsulas and islands, except Madagascar, off the east coast, separated by the Mozambique Channel. In the north there is a single great gulf, the Gulf of Tripoli. On the west, about 4°N., the continent narrows to half its width, forming the Gulf of Guinea. Africa, therefore, is the most compact

of the continents which form the island of the Old World.

Relief. Look at fig. 126 showing the relief of Africa. Lines are drawn at 600 feet below sea-level, and at 600,

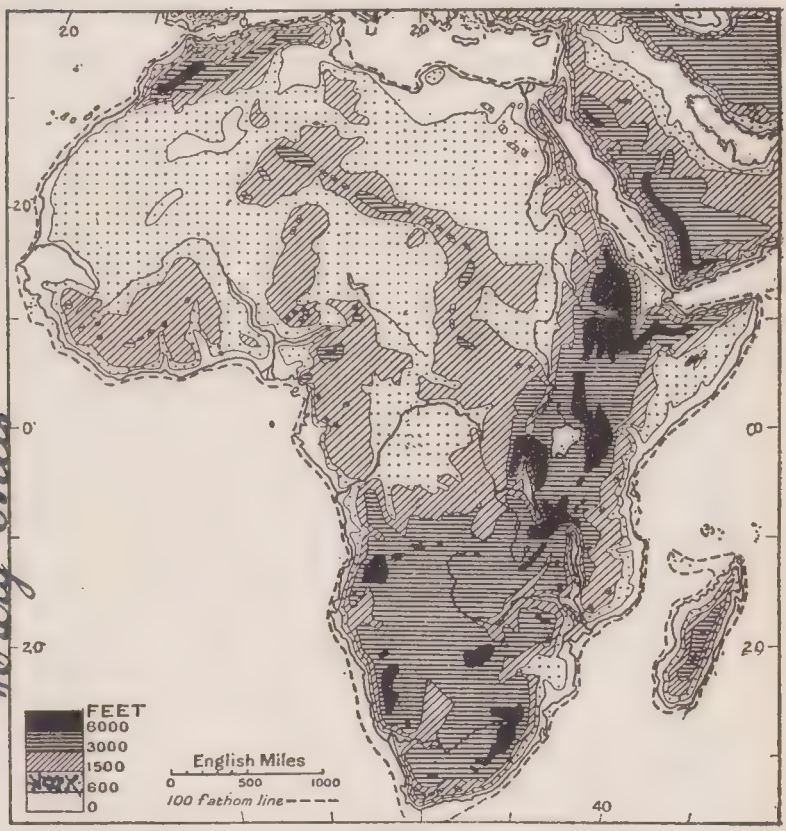


FIG. 126. Physical Features of Africa.

1,500, 3,000, and 6,000 feet above. Notice the uniformity of Africa, compared with the other continents. The continent is a tableland or series of tablelands, lower in the north and west, higher in the south and east. Except in the northwest, where the Atlas Mountains rise to the height of over

6,000 feet, there is little land over 3,000 feet in north and west. In the south and east, on the contrary, except for the narrow coastal plain, and along the courses of the rivers there is little land lower than 3,000 feet. Notice that the highlands everywhere come close to the sea, forming a more or less steep escarpment, and leaving only a narrow coastal plain at the base. The rivers, therefore, all form falls or rapids, where they descend from the plateau to the plain below.

Natural Regions. Africa consists of several well-marked regions:—(1) The high north-west margin, forming the Atlas Mountains. (2) The Sahara, or rainless desert, mostly below 1,500 feet in height but with isolated masses of higher ground rising to over 3,000 feet. (3) The Niger basin and upper Guinea. (4) The Nile basin. (5) The Congo basin. (6) The Abyssinian Highlands in the north-east. (7) The Plateau of the Great Lakes. (8) The Southern Plateau, drained by the Zambezi and other rivers.

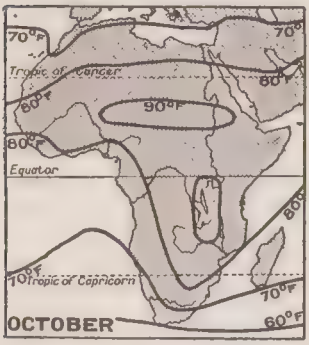


FIG. 127. Mean Temperature in October reduced to sea-level.

Climate. Look at the maps of temperature (figs. 127, 128 a, 128 b). Notice that three-quarters of the continent lies between the tropics. The temperature is, therefore, everywhere high. Only in the extreme north and south and in the highest parts is the average temperature under 60° in the coldest month. This is about the temperature of the warmest month in southern England.

Notice that it is hotter at the equator in October than in January and July. This is because the Sun is overhead at noon at the equinox, but it is overhead at the tropic of Cancer in July and at the tropic of Capricorn in January. The

effect of this can be seen when the three maps are compared. It will be noticed that at the equator it is never so hot as it is farther north and south. The rainfall maps show a belt of heavy rainfall at the equator at all seasons. Consequently there is a belt of cloud which screens the surface of the Earth from the direct rays of the Sun. The length of day and night is always equal at the equator, but the day is $10\frac{1}{2}$ hours in winter and $13\frac{1}{2}$ hours in summer at the tropic. The seasonal ranges of temperature are consequently much greater at the tropic than at the equator. They are, as we have already

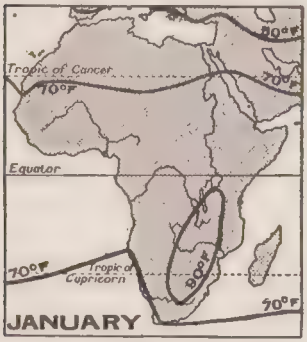


FIG. 128 A. Mean Temperature in January reduced to sea-level.

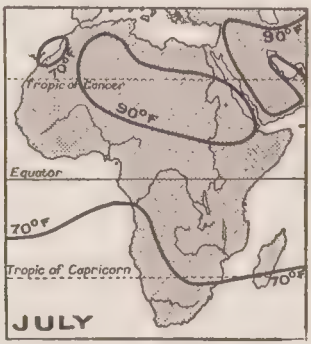


FIG. 128 B. Mean Temperature in July reduced to sea-level.

learned, greater in the interior than near the coast. Round the tropics the rays of the Sun beat down upon the soil which has no covering of vegetation to protect it. In the desert the difference of temperature between day and night and between winter and summer is very marked. The extreme north and south of Africa have winter and summer temperatures corresponding to those of the Mediterranean at the same elevation.

The equator bisects the continent, so that allowing for the difference in the breadth and height of the land there is great similarity in the zones of climate and vegetation north

and south of the equator. On either side of the equatorial belt, where heavy rains fall at all seasons, is a belt in which fairly abundant rains fall in summer (see fig. 129). Do not forget that south of the equator summer occurs during the northern winter. North and south of these belts of summer rains are the rainless deserts, covering the whole of the continent in the north, where it is broadest, but much narrower in the south, where it tapers. On the north-western margin of the northern, or Saharan desert, the

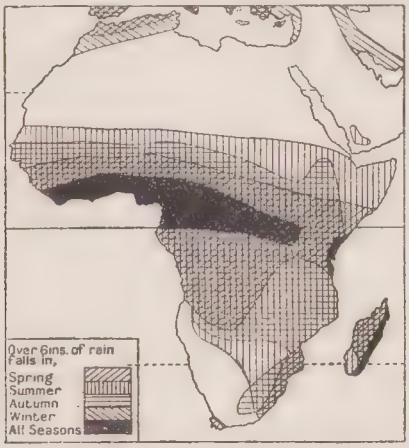


FIG. 129. Rainy Seasons in Africa.

Atlas region has winter rains, that is, the Mediterranean climate, already explained. A similar climate is found in the extreme south-west corner of South Africa, for similar reasons. The south-east of South Africa and Madagascar are included in the region of summer rains (see fig. 129). The mean annual rainfall is shown in fig. 130.

The cause of these differences in the season at which rain falls depends largely on the heating and cooling of the air over sea and land. Where the sun is highest, and the air most heated, a belt of air is always rising, and

passing into higher and colder layers of the atmosphere, where it parts with some of its moisture as rain. This belt moves north and south of the equator with the sun, but the equator is always within it. This explains why there is rain at the equator at all seasons of the year, and why the regions to the north and south have rain in summer when the sun is highest.

This rising of air in the equatorial belt explains the permanent winds known as trade winds. They are caused

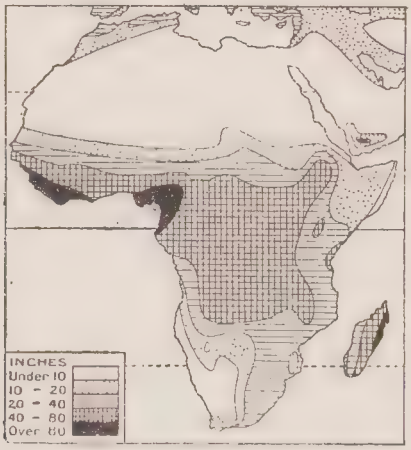


FIG. 130. Mean Annual Rainfall of Africa.

by the indraught of air due to the rising of heated air in the equatorial belt. They would blow from north to south but for the rotation of the Earth, which deflects them into north-east winds in the northern, and south-east winds in the southern hemisphere. As they are passing to warmer layers of atmosphere, where they can hold more moisture, they do not bring rain except when they encounter a barrier, whether of high coast or of mountains, by which they are forced upwards, chilled, condensed, and obliged to part with their moisture as rain. This happens most readily in summer, when the air over the land is also rising. The summer rains

of the south-east of South Africa, and of Madagascar are due to this cause.

The trade winds which blow over North Africa have not passed over any considerable area of sea in their course from the north-east. They bring little moisture, so that North Africa is almost rainless except in the Atlas region, which is climatically part of the Mediterranean. In South Africa they have come over sea, but they part with their moisture on the highlands of the east, and blow over the west as dry winds.

Compare with the above these figures:—

Algiers	78·1° July 54·0° Jan.
Biskra	90·0° July 52·0° Jan.
Cape Verde Islands	77·9° July 72° Jan.
Zanzibar	82·7° Mar. 77·0° July and Aug.
Cape Town	69·9° Jan. 55·1° July.
Durban	74·8° Jan. 63·1° July.
Johannesburg (5,700 feet)	65° Jan. 50° July.

Vegetation. Well-marked vegetation zones correspond to these climatic zones. In the extreme north, where the Mediterranean climate prevails, the Mediterranean cereals, fruits, and evergreen woods are found (see fig. 131). Towards the edge of the desert these give place to poor grass land, with scrubby mimosas, and other gum-yielding trees. In the desert itself plants grow in scattered tufts, and consist of thorny or fleshy plants, adapted in different ways for resisting drought. To the south the desert passes into poor scrub land, south of which lie the savanas, with summer rains. These savanas are often called park lands, a name which well describes them, The trees grow in clumps and glades, giving a beautiful and park-like appearance. They are often massive, like the baobab. New palms make their appearance, as well as tropical fruits, of which the banana is one of the most valuable. Still further south is the hot, moist, equatorial forest with innumerable species of trees, creepers, parasites, fungi, and every form of vegetable life. Many descriptions

have been written of the tropical forest, but every traveller ends by saying that it is impossible to give any idea of its rank luxuriance. It contains many plants useful to man,

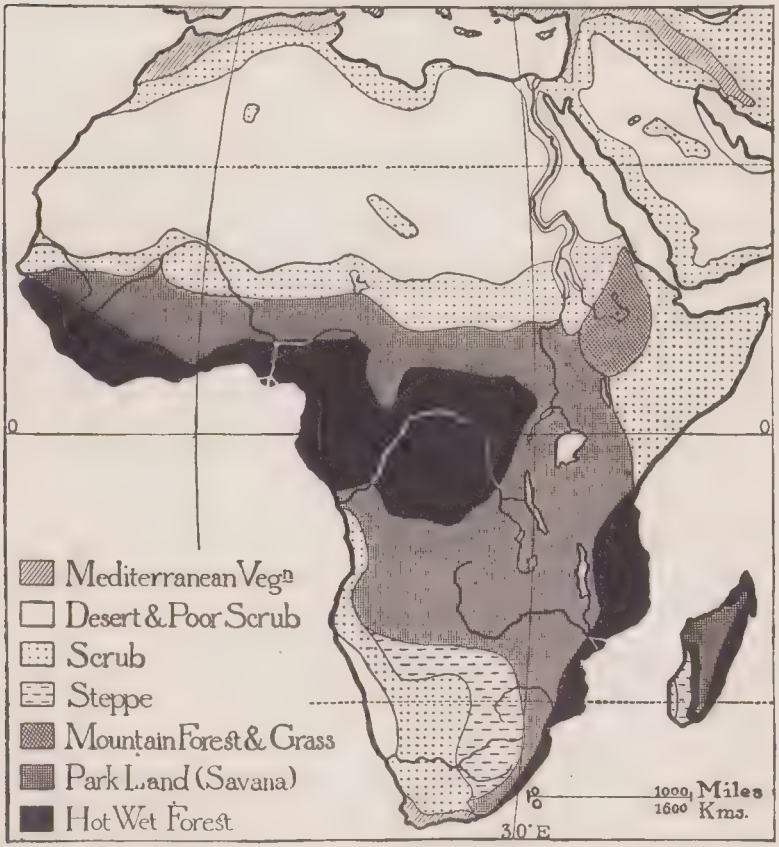


FIG. 131. Africa: Vegetation.

such as rubber, but it is so impenetrable except along its rivers that little more than its fringe is known (see fig. 131).

South of the equator these zones are repeated in inverted order. The dense forest is succeeded by savanas, and these again by poor scrub lands, passing into desert, with scrub

lands and temperate woods beyond their southern margin. In temperate South Africa actual forests are rare. Plants of the heath type are very common. The fruits and cereals of Central Europe and the Mediterranean can be grown.

Different animals are associated with these different zones of vegetation. North of the Sahara the animals are those of Southern Europe. On the margin of the deserts goats and camels are the chief animals, the camel being the only animal able to cross the desert. In the savana lands appear new animals, the antelope, zebra, giraffe, elephant, rhinoceros, lion, panther, hyena, leopard, and others. The hippopotamus makes his home in the swamps of the river banks. The river waters are infested by crocodiles. Of birds the wingless ostrich is the most notable. Insects are numerous, sometimes gigantic, and often dangerous. The termite, or white ant, destroys everything but stone, metals, and the hardest of woods. Certain flies convey the germs of diseases to men, cattle, and horses. In the equatorial forest animals are crowded out by trees. The commonest are those which make their home in trees, including monkeys of all sizes. In the extreme south the animals of Europe have been introduced, including the merino sheep from Spain and the Angora goat from Asia Minor. Ostrich farms are numerous in the south and east.

The Atlas, or Barbary Region. This is a high mountain region, consisting of a fertile, well-watered strip of coastal plain, rising in the south to the Atlas Mountains. In the west the Atlas consists of two ranges, the Great Atlas and the Anti-Atlas, further east of three chains. It is highest in the west, where it rises to nearly 14,000 feet. The long slope to the Atlantic, which receives winter rains, is forested below the snow-line, and the lower slopes are fertile. Beyond the land is arid, but the valley between the Great and the Anti-Atlas contains enough water to irrigate several oases. The western part of this region forms Morocco (area about 220,000 sq. miles), now a French protectorate, except for an area in the north

which is Spanish and Tangiers which is internationalized. The chief inland towns are Morocco City, or Marakesh, in a plain encircled by the snow peaks of the Atlas; Mekinez, and Fez. Agriculture is carried on in the coastal plain, on the lower slopes or terraces, and in the oases. The olive, fig, orange, and other Mediterranean trees are grown north of the Atlas. The evergreen oak is the chief forest tree. Cereals are largely grown, barley covering many miles of the more fertile northern plains. In the oases, of which Tafilet is the largest and most fertile, the date is the most important tree, though cereals and fruits are also grown. In the drier parts cattle, sheep, and goats are kept. Many wandering tribes combine pastoral occupations with raids for plunder.

East of Morocco the Mediterranean coast is bordered by a lower coastal range, separated from the northern range of the Atlas by a fertile valley called the Tell. The Tell is cultivated with vineyards, olive gardens and cereals. Between the two main ranges to the south lies a high arid plateau, dotted with salt lakes or shotts. Much of it is covered with the esparto, or alfa grass, which is exported for paper making. South of the southern range is a depression with another chain of shotts.

The western part of this region is the French colony of Algeria (area about 185,000 sq. miles). The capital is Algiers, built at the foot of and up the slopes of hills overlooking the Mediterranean. Oran to the west, with a fine harbour, and Constantine to the east, on a rock commanding the Tell, are next in importance. The eastern part is the French protectorate of Tunisia, of which Tunis is the capital.

The Sahara. The Sahara extends from the Atlas to the Red Sea, and from the Mediterranean to about 25° S. It is the largest desert area in the world, and is almost as large as Europe. It is continued eastward by the desert of Arabia, beyond which is the desert belt which stretches across Asia. This belt, therefore, extends from the Atlantic nearly to the

Pacific, but it is in North Africa that it is broadest and most unbroken.

The surface of the Sahara is covered in parts with a scanty vegetation, but the greater part consists of sand-dunes, sometimes rising as high as 600 feet. Travellers have compared its surface to that of an ocean of sand, broken into crests and troughs, and have described the intolerable toil of climbing crest after crest, only to see before them an unbroken series of similar crests and troughs, glaring in the blinding sunshine. The sand of the desert is produced by the weathering of the rocks, and is not, as used to be thought, the bed of an old sea. In some parts the surface consists of rough stony tablelands, scoured bare of sand by the violence of the desert storms. Here and there in the lower parts water can be found at no great depth by sinking wells. Round such wells, or round natural springs, are oases of date palms, varying in size with the amount of water available for irrigation.

On the margin of the Mediterranean enough rain falls to make a narrow strip less infertile. This forms Tripoli and Barka (area about 400,000 sq. miles), which belong to Italy.

The most important part of the Sahara is Egypt (area excluding Nubia and deserts, 10,500 sq. miles), now a kingdom, which before the great war was Turkish, though under British control. It consists of the valley of the Nile, which varies from five or six miles in breadth in Nubia, to thirty miles in lower Egypt. On either side of this ribbon of green stretches the desert.

The Nile Basin and Egypt. The Nile rises south of the equator on the Great Lake Plateau. Look at the map and trace its course (fig. 125). Its head stream, the Kagera, flows into the great Victoria Nyanza, or lake, which is nearly as large as Scotland. The river then descends from the higher to the lower plateau, forming falls, and flows into Albert Nyanza, which itself receives a large tributary from Albert Edward Nyanza, further south. After leaving Lake Albert the river

descends again, and then flows through the fertile savana land of the Sudan, forming swamps many miles wide, which become a great lake when the river is in flood. In this part of its course it is often blocked by masses of floating vegetation called the sudd, which it has torn from its banks and swept along with its current. On the northern edge of the Sudan, where the country passes into poor scrub, it receives two important tributaries, the Blue Nile and the Atbara, from the Abyssinian Highlands. At the confluence of the Blue Nile, a rapid mountain river, is Khartum, the capital of the Sudan. Below the confluence of the Atbara the river makes a great S-shaped bend, and flows for 1,800 miles in a steep-walled valley of varying breadth. The desert extends on either side, and the great river receives no other tributary for the remainder of its course. Below the mouth of the Blue Nile it forms six cataracts in the course of its descent to the Mediterranean, which it enters by a great delta (fig. 132). Notice that the Nile rises in the equatorial region of constant rains, and that its middle course and its Abyssinian tributaries are in the region of summer rains. To the first is due its steady flow, to the second its periodical floods in summer and autumn. On these floods depends the very existence of Egypt. Since the British occupation great engineering works have been undertaken to regularize the supply of water to the land. The river has been dammed at Assuan, at the first or most northerly cataract, at Assiut, and at the head of the delta, to hold back a proportion of the flood waters for distribution by irrigation canals during the season of low Nile. This slightly extends the area of fertile Egypt, and enables several crops to be grown in the year.

Wherever water can be brought Egypt is exceedingly fertile. Wheat is largely cultivated, as well as maize and millet, and barley. Pulses, and especially lentils, are a staple product. These are mainly winter crops. The most valuable summer crop is cotton, which is becoming the most important of Egyptian products. Rice and sugar cane are grown in the

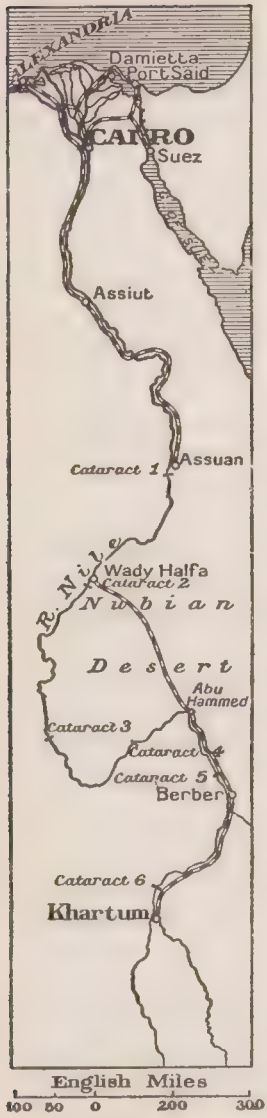


FIG. 132. The Nile below Khartum.

marshy delta. Date groves line the river far into the Sudan. (Refer back to figs. 106, 107.) The fruits of the Mediterranean ripen in the Nile valley as far south as the Sudan, where the banana becomes the most important fruit. Look at the map, and notice that the Nile forms the only practicable route across the desert from the Nile to the interior. The narrow isthmus of Suez, separating the Mediterranean from the Red Sea, is pierced by the Suez Canal, which saves the long sea route round the south of Africa. Egypt commands the canal, and controls the routes leading from it. This gives it its great political importance. Alexandria, west of the delta, one of the oldest cities in the Mediterranean, is the outlet for the Nile and Egyptian Sudan. Cairo, at the apex, is the capital. Not far off are the famous Pyramids of Egypt. A railway runs from Cairo to Assuan, whence the traveller proceeds by steamer to the Second Cataract. From there a railway crosses the desert, avoiding the great Nile bend, to the Nile opposite Khartum (fig. 132).

Abyssinia. The Abyssinian Highlands are a volcanic plateau, rising to 14,000 or 15,000 feet. In many parts they are split by deep chasms or valleys, with sides a mile

in depth, whose perpendicular walls are formed of many-sided columns like those seen at Staffa or the Giant's Causeway. Such a country is extremely inaccessible. The climate and products of Abyssinia (area about 300,000 sq. miles), vary with the elevation. In the lowest, hottest parts, its climate and vegetation are tropical. Higher, in the region of summer rain and lower temperatures, coffee, vines, and cereals are grown in the savanas. Higher still are grown the hardier cereals, and animals are pastured. Abyssinia is an independent kingdom, the capital being Addis Abbeba. To this town there is a railway from Jibuti, on the Red Sea in French territory, to the north of which is the Italian colony of Eritrea (area about 88,000 sq. miles). East of this is Somaliland, occupying the horn of Africa, and divided into British Somaliland (68,000 sq. miles) in the north, and Italian (136,000 sq. miles) in the south. It forms the eastern end of the Sahara.

The Plateau of the Great Lakes. This plateau rises in a series of terraces from the east coast to the interior. It is crossed by two great rifts, each partly filled by a chain of lakes. In the western of these rifts lie Lakes Albert and Albert Edward, drained to the Nile, Tanganyika to the Congo, and Nyasa to the Zambezi. The lakes of the eastern rift are much smaller. (See figs. 125, 126.)

The northern part of the Lake plateau forms Kenya Colony (British East Africa), north of Victoria Nyanza. South of this lake is Tanganyika Territory (formerly German East Africa). The whole is less than 1,000 miles from the equator. The eastern coastal plain is narrow and unhealthy. Above it rise two or more terraces, relatively dry and unfertile, though forming savana lands in some of the higher parts. Along the eastern rift are a series of extinct volcanoes, rising higher than any mountains in Europe. Look out in a map the highest peaks, Kenya and Kilimanjaro, both crowned with eternal snow. Beyond the rift the land rises to 8,000 or 10,000 feet, and should be fit for white men to

live in. It sinks again to the swampy shores of Victoria Nyanza, which lies about 4,000 feet above the sea. To the west extends the rainy equatorial belt, with dense tropical forest. From Mombasa, on the east coast, a railway has been built to Kisumu, on Victoria Nyanza, whence a steamer carries the traveller to the north-western shores, which form part of Uganda. Cotton is the chief product, and the banana the staple food. Above the western rift towers the magnificent snow-crowned group of Ruwenzori, overlooking Lakes Albert and Edward. Between Lake Edward and Tanganyika is a group of active volcanoes, discovered only a few years ago, and remarkable as being further from the sea than any previously known. A railway runs from the port of Dar es-Salaam through the middle of Tanganyika Territory to Lake Tanganyika.

Zanzibar and Pemba, two small islands off the east coast, are noted for their cloves. Both are under British protection.

The Niger Basin and Sudan. Immediately south of the Sahara comes the belt of lands with summer rains, extending across the continent to the highlands of Abyssinia. This belt forms the Sudan. It is a rich park land, with a fertile soil, in which are grown maize, millet, and other cereals, as well as many tropical fruits. It is drained by three great rivers, the Nile in the east, the Shari in the centre, flowing to Lake Chad, which has no outlet, and the Niger in the west.

The Niger rises near the coast and flows inland, forming a broad marshy flat valley like the middle course of the Nile. It runs to the south-east, breaking through the Niger Highlands in a densely forested gorge, from which it emerges first into open wooded lands and then into the dense forests of the Guinea coast. The oil palm is the chief tree of the delta and the lower Niger. Its largest tributary is the Benue, from the east. The delta of the Niger is typical of much of the Guinea coast, which is a low, unhealthy, densely forested land, rising to the north to the Guinea plateau, which is of no great height. It is intersected by innumerable creeks and rivers, which are

important means of communication in the impenetrable forests. At the mouth of the rivers, in the region uncovered by the tides, are mangrove swamps, with contorted roots, covered with slimy and reeking mud. The coast is destitute of harbours and is incessantly beaten by surf. 'It would be a drowning matter,' writes Sir H. M. Stanley, 'for a crew of sailors unaccustomed to the surf to attempt to land anywhere between the Sherbro and Lagos, a distance of 1,200 miles.' Some of the tribes of these forested areas are very savage.

The greater part of Central and Western Africa north of the Congo, about 1½ million sq. miles, is French. The British possess the Lower Gambia, Sierra Leone, with Freetown, the one good harbour of the Western Guinea coast, the Gold Coast, Lagos, and Nigeria, consisting of the lower basin and delta of the Niger, the total area being about 165,000 sq. miles. The independent state of Liberia lies east of Sierra Leone. Togoland, east of the Gold Coast, and Cameroon, south-east of Nigeria, were taken from Germany in the great war.

The chief products of the Guinea coast are ground nuts in the west and the oil palm in the east. In the tropical forests rubber and other tropical products are obtained. The climate is suitable for cotton. Coal is found at Udi in Nigeria, and tin in other parts of the country.

The western part of the Sudan has long been inhabited by races of Arab and negro blood, who have attained a relatively high degree of civilization. They are clever tillers of the soil, they practise many arts and crafts, and are accomplished traders. Their towns, instead of being mere collections of huts, like those of most negroes, are strong walled cities, some with a large population. Bida and Kano, both in the basin of the lower Niger, are great commercial centres of their Sudan trade. Zungeru, the capital, and Lokoja, at the confluence of the Benue, are other towns. Timbuktu, at the great bend of the Niger, is the capital of the French Sudan.

Communication is still in a backward state. Camel cara-

vans are used in the interior, towards the desert. Roads are little more than tracks. In the forest the rivers are the chief means of communication.

From Lagos a railway is built north to Kano, and continued beyond Zungeru to Zaria. Other railways have been built from the coast inland, and are being extended. A French line connects the upper Senegal with the upper Niger.

The Congo Basin. Look at the map and notice how the Congo basin is surrounded on all sides by high ground, down which the tributaries flow either north, or west. Trace the course of the main stream on the map. It rises south of Lake Tanganyika, and flows north through Lakes Bangweolo and Mweru, receiving the surplus waters of Tanganyika. Many of its tributaries rise quite near to those of the Nile. The most important is the Welle, which, like the main stream, flows through a country which is densely forested in the valleys, but rises to opener woods and savanas at higher elevations. The middle Congo is navigable for 1,000 miles to Stanley Pool, where it forms a lake-like expansion. Below Stanley Pool it breaks through the Lower Guinea Plateau in a densely forested gorge, forming falls and rapids, and enters the Atlantic by a deep estuary. A railway has been built from Leopoldville, on Stanley Pool, to Boma, to avoid the rapids, and carry rubber, ivory, and other forest produce to the coast. The natives of the Congo basin, like those of other densely forested parts of Central Africa, practise many revolting customs, including cannibalism. Politically the Congo basin is divided into the Congo State (area about 900,000 sq. miles), controlled by Belgium, French Congo to the north of the estuary, and the Portuguese territory of Angola (area about 457,000 sq. miles) to the south. The highlands of Angola are planted with coffee, which is carried by rail to the port of San Paul de Loanda.

The Zambezi Basin. Look at fig. 125, and trace the course of the Zambezi. The divide between it and the Congo is not very definitely marked. It rises in wooded highlands, but in

its lower course enters a region of dense forest. Like all the African rivers its course is broken by falls where it passes over the terraces of the plateau. The highest of these are the famous Victoria Falls. Above the falls the river is over a mile wide, and the gorge into which it plunges is only some 400 or 500 feet wide. The fall is about 400 feet. On the left the Zambezi receives a very large tributary, the Shire, which has come down from the Nyasa or Blantyre Highlands, forming rapids in its descent from terrace to terrace. These highlands, the most prosperous part of British Nyasaland, are planted with coffee, cotton, cereals and fruits, according to the elevation. The lower course of the Zambezi lies in Portuguese East Africa. It enters the sea by a great delta, with mangrove swamps in its tidal area.

The middle portion of the Zambezi basin forms Rhodesia (area about 312,000 sq. miles), a British forest and savana land, in some parts rich in minerals. The railway from Cape Town is being pushed north and has nearly reached Lake Tanganyika. Very little of Southern Rhodesia is less than 3,000 feet above the sea. The greater part is above the fever-line, which is here about 4,000 feet. All kinds of cereals and fruits are or can be grown. The country is rich in minerals, especially gold, which has long been worked here by the natives. The capital is Salisbury, joined by a line through Portuguese territory to Beira. From Salisbury a line runs to the Victoria Falls line, which goes south through Bulawayo across Bechuanaland into Cape Province.

South Africa is British. It includes the Union of South Africa, containing four provinces—Cape of Good Hope in the south, Orange Free State in the centre, Natal in the east, Transvaal in the north. In the north-west is Bechuanaland, and the colony of South-West Africa taken from Germany in the great war. South of the Limpopo the plateau is under 4,000 feet only in the river valleys. Like the rest of South Africa it rises from the sea in a series of terraces, forming undulating lands, grassy in the east and desert in the west (see fig. 125).

The high grassy tablelands form the High Veld. The land is highest in the south-east, where it reaches 10,000 or 12,000 feet in the Drakensberg Mountains. These mountains, in which are the sources of the Orange and its tributary the Vaal, contain the finest scenery in South Africa. Many of the peaks are above the snow-line. These mountains are sheer to the east with deep ravines and magnificent falls, the Tugela Falls, the most famous, having a drop of 1,800 feet. To the south are two terraces, the Great and Little Karroo, the former walled in by the Lange Berge, the latter by the Zwarte Berge. Looking from the Great Karroo northward to the High Veld, the escarpments of the terraces appear as mountains and are known by various names. The Karroos are dry high plains with scanty rainfall and vegetation. The east and south terraces and the eastern margin of the High Veld are fertile, and contain most of the population. The rest is poor grazing ground, passing in the west into the Kalahari desert. On the low warm coastal plain sugar is grown, with tea on the lower and maize and other cereals on the higher slopes.

The discovery of diamonds at Kimberley, in Cape Province, near the confluence of the Vaal and the Orange, and of gold in the Transvaal, on the Witwatersrand, or Rand, the divide between the Vaal and Limpopo, has attracted a large population. From Johannesburg, on the Rand, the largest town in South Africa, lines run through Pretoria, the capital of the Transvaal (area about 120,000 sq. miles), to Lourenço Marques, the capital and chief port of Portuguese East Africa, on Delagoa Bay; through Pietermaritzburg, the capital of Natal (area about 35,000 sq. miles), to Durban, its port; and through Bloemfontein, the capital of the Orange Free State (area about 48,000 sq. miles), to East London, Port Elizabeth, and Cape Town, the ports of Cape Province. From these ports the line is connected, through Kimberley, with Bulawayo and the north. Sheep and goats are largely kept on the Veld and Karroos. Ostrich farming is important in the east of Cape Province. Vineyards do well in the south-west, where

the climate is that of the Mediterranean. Cape Town, the capital of Cape Province (area about 277,000 sq. miles), occupies a magnificent site on a beautiful bay, behind which rises Table Mountain, 3,600 feet high.

African Islands. Madagascar is about twice the size of the British Isles. The west coast is low and swampy. Above, the land rises in terraces to a savana-covered plateau, which descends much more steeply to the narrow east coastal plain, fringed with lagoons. The lowlands are densely forested,

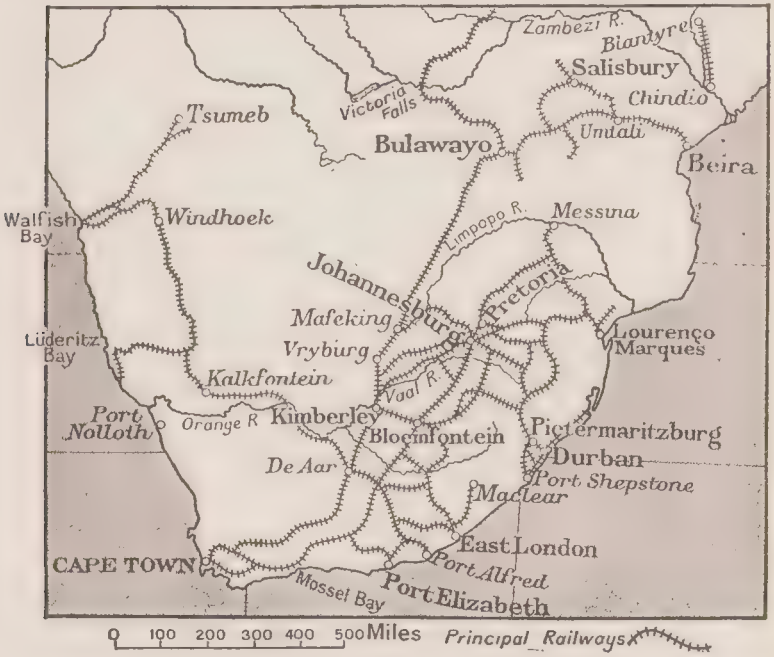


FIG. 133. Towns and Routes of South Africa.

yielding rubber. A railway connects Tamatave, the port, on the east coast with Antananarivo, the capital, in the centre of the plateau. Madagascar is a French possession.

Réunion (950 sq. miles), a French, and Mauritius (700 sq. miles), a British island, are both volcanic. They yield sugar, coffee, vanilla, and other tropical products. Port Louis is the capital of Mauritius.

St. Helena and Ascension are volcanic islands in the Atlantic. Both are British. The Cape Verde Islands and Madeira, also volcanic, belong to Portugal. They produce sugar, and Madeira wine. The Canary Islands are Spanish. They produce sugar, wine, and bananas. The most beautiful is the volcanic peak of Teneriffe.

Peoples of Africa. In the north the Arabs and Berbers, belonging to the white race, form the bulk of the population, with Europeans in the settled parts near the Mediterranean coast. Peoples of white stocks are found as far south as Abyssinia, and even in the Great Lake Plateau. In the Sudan they are much mixed with negro blood. The bulk of the population of the Sudan and West Africa is negro. Of these the Hausas are the most civilized, and their language is the great commercial tongue of West Africa. South of the equator the Bantu negroes are in the majority. Their languages are all related to each other, and one of them, Swahili, is the commercial language of East Africa. In the forests are remnants of a dwarf race, the Pygmies. In the south-west the Hottentots and Bushmen are gradually dying out, but the Kaffirs, of Bantu stock, are increasing, and form the large majority of the population of South Africa. Of Europeans in South Africa the majority are of Dutch origin. The others are English, French, and German. Of the African races the Arabs, who profess Mohammedanism, and the tribes in contact with them, are the most civilized. The inhabitants of the savanas are superior to the forest tribes, who have many degraded customs and superstitions. The peoples of Africa are settled or nomadic, according to the nature of the occupation. The Arabs of the desert, for instance, are wandering herdsmen, while in agricultural regions the same race builds and inhabits walled cities.

The population is supposed to be about 160,000,000. It is nowhere very dense, except along the lower Nile in Egypt. The Sudan, the Barbary Coast, and the fertile parts of South Africa come next in density.

AUSTRALASIA, PACIFIC ISLANDS

Position. The name Australasia is given to the great area of sea and land which includes Australia, New Guinea, New Zealand and many other islands. Australia, the largest island, is nearly 3,000,000 sq. miles or over $\frac{3}{4}$ the size of Europe. New Guinea, to the north, the second in area, is about $\frac{1}{10}$ the size of Australia. Tasmania, to the south, separated from Australia by Bass Strait, is about $\frac{1}{10}$ the size of New Guinea. Notice that all these rise from the same continental shelf.

Seas, Gulfs, Peninsulas, and Islands. Australia is compact like Africa (fig. 134). The Gulf of Carpentaria, on the north coast, is the only very large gulf. In the south is the great incurve called the Great Australian Bight. Notice also the Spencer and St. Vincent Gulfs on the south coast.

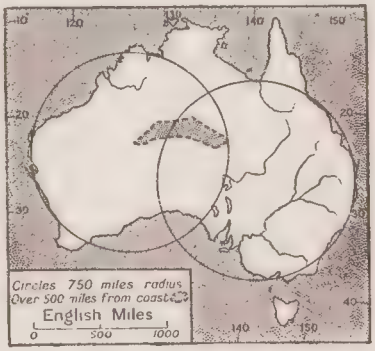


FIG. 134. The circles are 1,500 miles in diameter and the shaded area over 500 miles from the coast.

Relief. Look at fig. 135, showing lines for 600 feet below sea-level, and for 600, 1,500 and 3,000 feet above it. Notice that the only considerable area of land over 3,000 feet is in New Guinea, where the backbone of the island is formed by a lofty mountain range, probably higher than Mont Blanc. The southern part of New Guinea is a lowland. There are no mountains of alpine type in Australia. The Great Dividing Range, which is better called the Eastern Highlands, is a denudation highland. It rises steeply from the east coast, and slopes west to the Central Lowland which stretches almost from north to south of the continent. Farther west the land is a low tableland, with a few higher masses rising above it. Tasmania resembles the Eastern Highlands, of which it is a continuation. The mountainous islands of New Zealand are not part of the continent.

The Eastern Highlands, or Great Dividing Range, are known in different parts under different names. In the south, where they rise highest, the Blue Mountains and the Australian Alps may be noticed. The Blue Range rises from the lowlands in steep escarpments, which are extremely difficult to climb. Deep sunken valleys, with lofty precipitous walls, end in

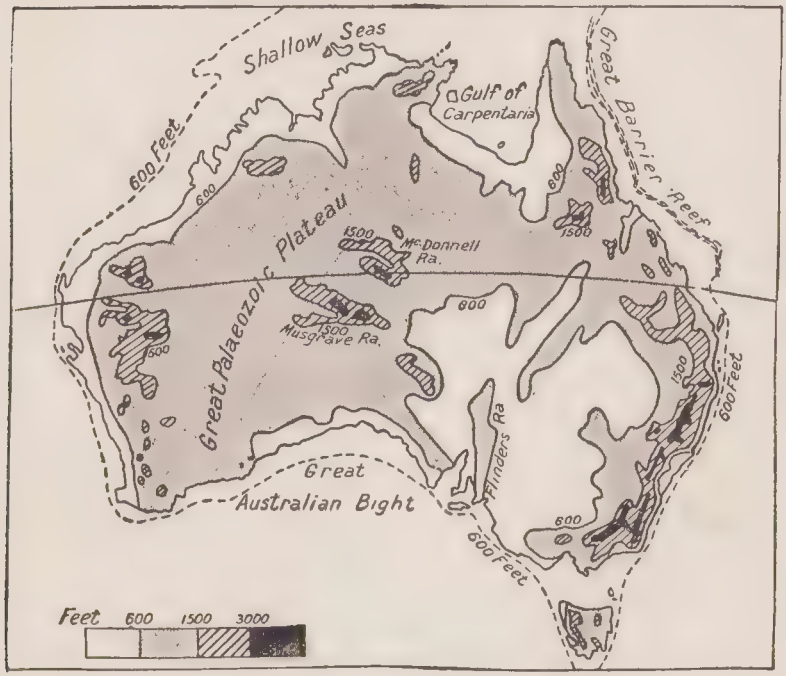


FIG. 135. Physical Features of Australia.

impassable gullies, and it took early settlers many years to find a route through this mountain barrier to the interior. In the south-east the Australian Alps rise in Mt. Kosciusko to over 7,000 feet, the last few hundred feet being above the snow-line.

The short eastern slope of the Eastern Highlands is drained to the Pacific by rivers of no great length. The western slope,

which is seldom more than 100 miles from the coast is drained to the interior. The only great river system in Australia is that of the Murray-Darling in the south-east. The Murray rises in the Australian Alps, and is joined by the Lachlan and Murrumbidgee from the Blue Mountains. All pass through deep gorges in the highland part of their course. The Murray unites with the Darling, whose head stream has risen in the Eastern Highlands near the tropic of Capricorn, and which has received numerous tributaries from the central parts of the highlands. The united river is turned south by the South Australian Highlands, and enters the sea through a large lagoon, Lake Alexandrina. A great part of this system of rivers is navigable during the wet season, but in the dry season many of the rivers composing it run dry, though the Murray, which is fed by the snows of the Australian Alps, is a permanent river. The northern half of the Eastern Highlands are lower but broader. Consequently the rivers which drain the seaward slope are longer. The Fitzroy and Burdekin may be noted. The western slopes are scored by many long river beds, but these are filled only in the wet season. When full they flow to Lake Eyre, in the centre of the continent, a basin of inland drainage similar to the Caspian and Aral seas in Eurasia, and Lake Chad in Africa (fig. 135). Round the north and west coast short rivers from the tableland flow to the sea. The south and centre are practically rainless, and have no permanent rivers. (Cf. fig. 136.)

FIG. 136. The Inland Drainage Area of Australia is shaded on this Map.

Climate. Only the extreme south and the higher ground has a winter temperature under 60°F. The summer temperature is extremely hot, for the land is broadest where the tropic crosses it. The difference between the summer and

winter temperature is great, but rather because the summer is extremely hot than because the winter is cold. The differences are greatest in the interior, and more on the east than on the west coast. Find the following places and compare their temperatures at different seasons. Darwin 87·3° Nov., 78·0° July; Alice Springs 87·6° Jan., 51·8° July; Perth 76·3° Feb., 55·0° July; Sydney 71·5° Jan., 52·5° July; Hobart 60·9° Feb., 45·7° July.

Look at the rainfall map in figs. 137, 138 and notice that only in New Guinea, East and North Australia, and Tasmania is the

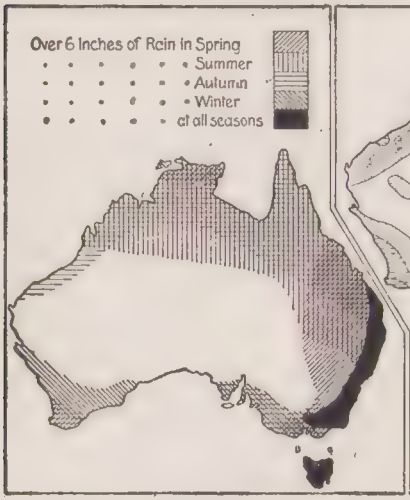


FIG. 137. Dry and Rainy Seasons.

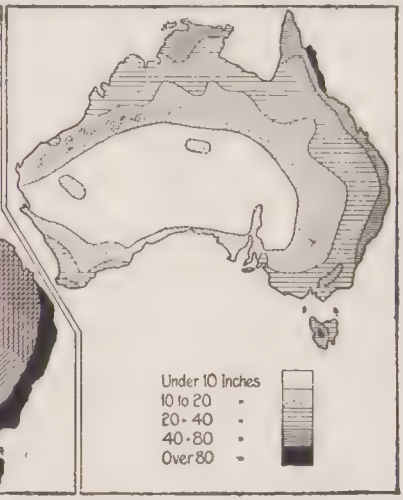


FIG. 138. Mean Annual Rainfall.

rainfall at all heavy. Over the greater part of Australia the rainfall is less than 20 inches, and within this large areas receive only 10 inches or less. Much of the interior is an almost rainless desert. Compare the much larger Sahara and the much smaller Kalahari. Like these deserts it lies in the trade winds area. These winds have parted with their moisture on the seaward slopes of the Eastern Highlands, and become hotter and drier as they pass inland. New Guinea lies near enough to the equator to receive abundant and frequent rains. In North Australia the winds blow in summer from

the sea to the land, from NW. in the west, NE. in the east, bringing summer rains (cf. India and China). Tasmania always lies in the track of the stormy west winds, which bring rain at all seaons. When the wind belts move northwards in winter the southern part of the Eastern Highlands is in this belt.

In climate Tasmania may be compared with Northern France, the extreme south of the Eastern Highlands with the Mediterranean, the centre of the continent with Northern Africa and Arabia, and the northern coast with India. Hence, allowing for differences in the arrangement of land and water, and of highland and lowland, we find the same types of climatic region south of the equator as we find in the north.

Vegetation and Products. Australia was early separated from the rest of the Old World by deep seas, and many plants and animals are peculiar to it. Most native trees are suited to a hot dry climate, and a very strong sun. The chief are eucalypts or gum-trees, and acacias or wattles. The eucalypts shed their bark and hang their leaves edgeways to the sunshine. The forests exist round the wetter margins. Much of the interior, where it is not mere sandy or stony desert, is covered with a scrub of thorny plants, very difficult to penetrate. Between forest and scrub or desert are grazing lands, which make stock-keeping one of the most important industries. (See fig. 139.)

At the time of its discovery by Europeans the animals of Australia included the kangaroo and opossum, the young of which are carried by the mother in a sort of pouch. The mammals and many birds and reptiles were strikingly different from those of the Old World. European colonists have introduced domesticated animals, and some wild ones. The rabbit has so multiplied as to be a national danger.

Roughly over one quarter of Australia is good agricultural land, over a quarter good pastoral land, less than a quarter is very poor pastoral land, and a quarter useless desert. The hard wheat is excellent in quality. Maize is grown where there is enough rain. Wheat requires at least 15 inches of rainfall a year, maize 30 inches, and sugar 40 inches.

The cultivated plants of the Old World have also been generally introduced in areas with suitable climates. Thus the cultivated products of Tasmania resemble those of Northern France, Tasmanian apples being exceptionally excellent. In the south-west and south-east the fruits and cereals of the Mediterranean, including the vine, are grown. In the wetter eastern and southern lowlands there are dairy farms with rich pastures. In the north-east the products of the hotter mon-

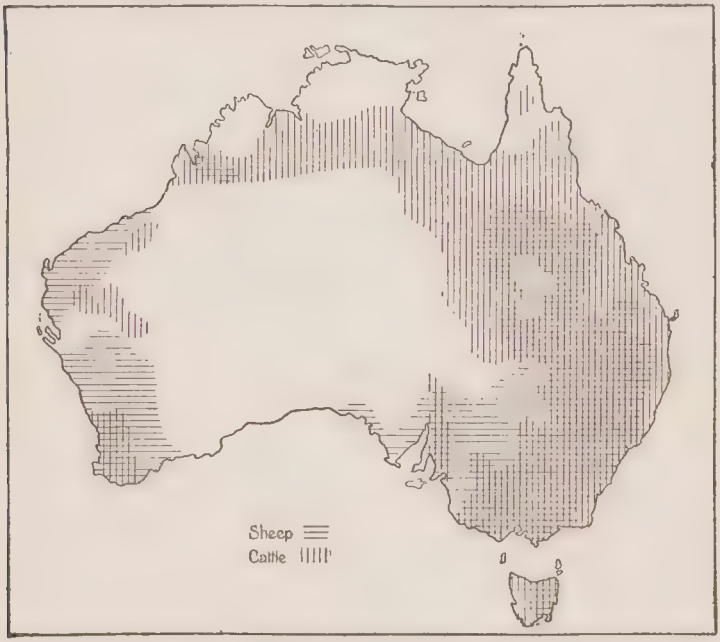


FIG. 139. Distribution of Sheep and Cattle in Australia.

soon lands are grown, more particularly sugar. Tea, cotton, and many other crops can be grown here and in New Guinea, where the tropical forests also produce rubber, &c.

The very great mineral wealth of Australia includes gold, silver, copper, lead, tin, coal, iron, and precious stones.

The aboriginal population is dying out, and the country is peopled by colonists of British descent. In the tropical north the climate is trying for Europeans, and the labour problem

is difficult to solve. Manufactures are steadily growing, but the market is still small. Australia needs a much larger population. Railways have been built in many parts from the coast to the interior. They are best developed in the east, where lines connect the chief towns of Queensland, New South Wales, Victoria, and South Australia with each other and with the interior. (See fig. 140.)

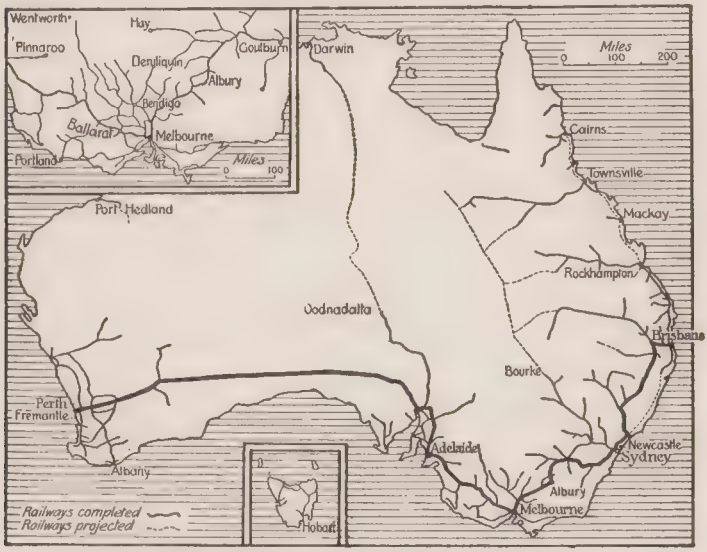


FIG. 140. Railways and Towns of Australia.

Politically by far the greatest part of Australasia is British. Part of New Guinea is Dutch. British New Guinea is a dependency of the Commonwealth called Papua.

The Commonwealth of Australia consists of six states, Queensland, New South Wales, and Victoria in the east, South Australia, West Australia, and Tasmania (fig. 141). Northern Territory and Papua are administered by the Commonwealth. Canberra is to be the federal capital.

Queensland (670,500 sq. miles, 758,000 people) is crossed by the tropic of Capricorn, and its products are tropical and sub-tropical. It is the rainiest and best watered of the states, and has the largest forest areas, producing valuable timber.

Only 1,600 square miles are cultivated, and 400,000 are used for grazing. The chief crops are sugar-cane (coast), maize, and wheat on eastern part of highlands. Cattle are commoner in the hotter, wetter north, sheep in the drier parts, where there are many artesian wells for watering stock. The mineral wealth is great. Gold, copper, and tin are the most valuable

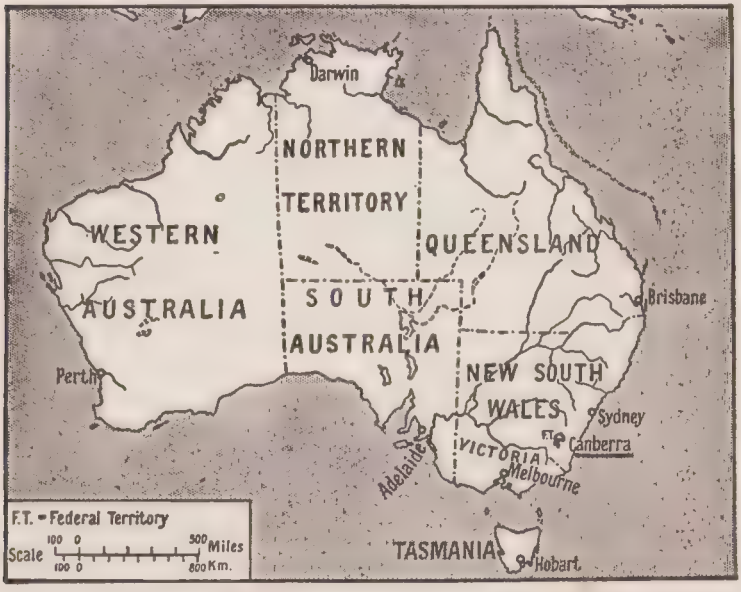


FIG. 141. The States of the Australian Commonwealth.

metals. Most of the towns are on the coast. The capital and chief port is Brisbane. Rockhampton and Townsville are starting-points of long railway lines into the interior. Ipswich is a coal and manufacturing centre.

New South Wales (310,400 sq. miles, 2,100,000 people) lies outside the tropics. The coast is well watered and fertile. In the north sugar is cultivated, and dairying is important. Cereals (wheat and maize) and fruits, including grapes, are grown on the 8,000 square miles which are cultivated. It has more sheep than any other state. Coal is found from Newcastle, through Lithgow, to Bulli. Gold is abundant in the eastern highlands,

especially near Bathurst and Goulburn. Silver is mined at Broken Hill, copper at Cobar. The capital is Sydney, on Port Jackson, one of the most magnificent bays in the world.

Victoria (88,000 sq. miles, 1,500,000 people) is the smallest and most rugged of the colonies. It is also the most extensively cultivated (9,000 sq. miles) and densely peopled. Sheep-farming is the most important occupation. Water from the Murray irrigates the Mildura fruit farms. Fruits and cereals (wheat and oats) are grown. The vine does well on the sunny hill slopes. Wool and dairy produce are the most valuable; next agricultural products, especially wheat; wine and fruit come next, and then minerals, mainly gold. Goldfields are important round Bendigo and Ballarat. The capital is Melbourne, on Port Phillip. Geelong manufactures wool.

South Australia (380,000 sq. miles, 495,000 people). It is most fertile in the south. Over 8,000 square miles are cultivated, mainly with wheat, hay, and vines. Owing to the dryness the wheat is extremely fine but poor in yield. Sheep-farming is important, but drought causes great losses. Copper is the chief mineral. The capital is Adelaide.

Northern Territory (524,000 sq. miles, 3,900 white people) was formerly part of S. Australia. There are hot, wet forests round the north coast, and rich pastoral lands suitable for cattle farther inland. Elsewhere it is desert or very poor pastoral land. Darwin may become an important port if a transcontinental line is built.

Western Australia (976,000 sq. miles, 332,000 people). The south-west is forested, containing the valuable hard timbers, karri and jarrah. There are about 2,600 square miles of land cultivated, mainly in the south-west. Wheat, hay, oats, fruit, and vines are the chief products. Sheep and cattle are kept in the river valleys. Western Australia produces as much gold as all the rest of the Continent. There are two gold belts, the eastern one from Kalgoorlie and Coolgardie to Pilbarra, and the western from Southern Cross to Cue. Water is pumped up over 1,300 feet in great pipes which run for nearly 400 miles from a reservoir near Perth to the Kalgoor-

lie gold-field. The capital is Perth, near the mouth of the Swan. Albany is the southern port. Coal is found near Collie.

Tasmania (26,200 sq. miles, 214,000 people) is about the size of Scotland. It is rich in minerals, especially copper and silver, tin, and gold. About 1,300 square miles are cultivated, two-thirds being in grass. The island is well wooded. Wheat, oats, potatoes, hay, fruit, and hops are grown. Sheep-farming is important. The capital is Hobart. Launceston lies opposite Australia.

New Zealand (105,000 sq. miles, 1,219,000 people) consists of two large islands, the North Island, and the South, or Middle Island, separated by Cook Strait, and the small Stewart Island, in the extreme south. The islands lie between 34° and 48° S., extending from the latitude of Sydney to 250 miles south of Tasmania. They are over 1,000 miles from Australia, from which they are parted by deep seas.

Look at the relief map, which shows the lines for 600 feet below sea-level, and for 600, 1,500, and 5,000 feet above sea-level (fig. 142). The North Island is much lower than the South Island, where Aorangi, or Mt. Cook, rises in the Southern Alps to over 12,000 feet. The glaciers of the Southern Alps are very extensive and descend into the forest zone. The valleys with their long narrow lakes, and the fiords of the coast resemble those of Scotland. North Island contains the active volcanoes of Ruapehu, over 9,000 feet, and Tongariro, over 7,500 feet. The extinct cone of Mt. Egmont, over 8,000 feet, is often compared with Fujiyama, in Japan. Geysers, hot springs, and other volcanic phenomena occur.

The latitudes correspond with those from Gibraltar to northern France. The climate is cooler and more equable, owing to the influence of the sea on the narrow islands. The climate of Auckland, 67° Feb., 52° July, rainfall 42 ins.; Hokitika, 60° Jan., 45° July, rainfall 114 ins.; and Christchurch 61·7° Jan., 42·5° July, rainfall 26 ins., may be compared with Lisbon, 71° July, 51° Jan., rainfall 29 ins.; Valentia (Ireland), 59° July, 45° Jan., rainfall 56 ins.; and Greenwich, 64° July, 38° Jan., rainfall 25 ins. Compare the latitudes of these

places. The forests of the North Island contain valuable timber, including the kauri pine, which furnishes a most useful gum. Large deposits of this gum, the produce of forests long perished, are dug out of the ground. Owing to the westerly storms the west coast is the wetter, as in Britain, and the

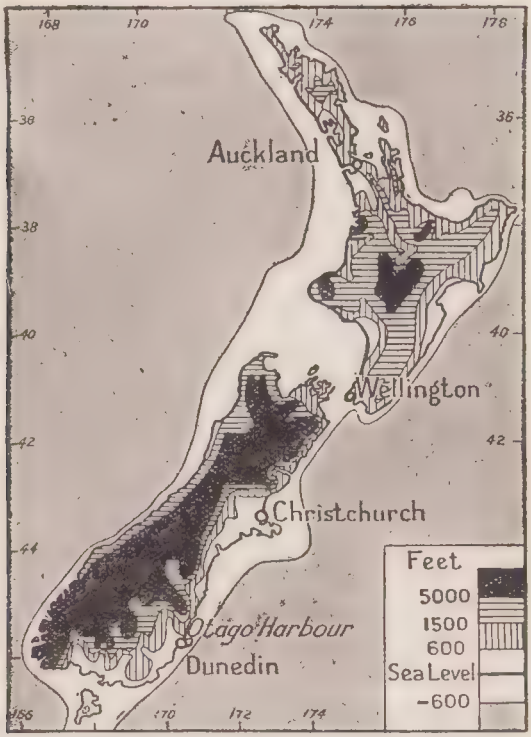


FIG. 142. Physical Features of New Zealand.

east coast drier. The west is covered with forests, the total forested area being 30,000 square miles. Two-thirds of New Zealand is suitable for agriculture. At present over 20,000 square miles are sown with grass, and nearly 3,000 square miles are cultivated mainly with oats and wheat. The drier east is pasture land, on which millions of sheep are fed, the finest being kept on the famous Canterbury Downs, in the lee

of the Southern Alps. Gold, coal, and silver are the chief minerals. The gold occurs in the rocks of Westland and the Thames basin, and is washed out of the river sands in the south-east. The chief exports are wool, frozen meat, dairy produce, gold, tallow, hides, and kauri gum. The largest town is Auckland, on the narrow isthmus separating the north-west peninsula from the rest of the North Island. It has harbours on both sides of the isthmus. The capital is Wellington on Cook Strait, in North Island near the centre of the islands. In South Island Christchurch and Dunedin, on the east, export the produce of the pastoral districts. Hokitika and other western ports export gold and coal.

The Pacific Islands. The Central and Western Pacific are studded with small islands between 30° N. and S. The most important are New Caledonia (French), Hawaii (American), Fiji (British), and Samoa (partly American). The majority are either mountainous forested volcanic islands, or low coral islands. New Caledonia has sedimentary as well as igneous rocks.

The climate everywhere is hot but equable. The wet and dry seasons are well marked. The volcanic islands are the more fertile, growing sugar, bananas, and other tropical produce. The coco-nut palm is important along all the coast, and the dried flesh of its nut supplies copra, which is used in many manufactures. Some islands yield phosphates, useful as manures, from the guano of birds. The inhabitants of the islands of the south-west are short, dark, and frizzy haired, belonging to the Papuan, or Melanesian race. In the eastern islands they belong to the tall, fairer, and much more intelligent Polynesian race. The majority are clever sailors and fishers, and practise many arts. Many Chinese and Japanese have emigrated to the plantations, especially in Hawaii.

AMERICA

NORTH AMERICA.

Position. Look at fig. 144 and note the position of North America. It almost touches Asia in the north-west, where the two continents are separated by Bering Strait, and comes nearest to Europe in the north-east. It is broadest to the north and tapers to the south where it is joined to South America by the narrow isthmus of Central America. On the west it is bounded by the Pacific Ocean, on the east by the Atlantic, and on the north by the Arctic Ocean. The mainland begins about 500 miles from the equator, and extends to within 1,500 miles of the North Pole.

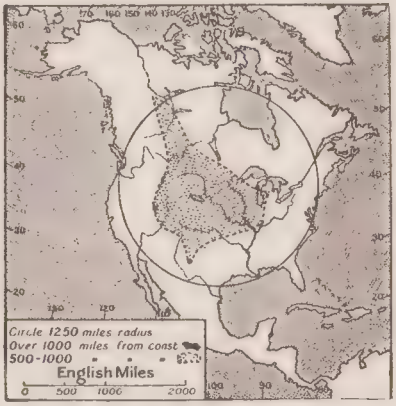


FIG. 143. The circle is 2,500 miles in diameter. The black area is over 1,000 miles from the coast. The land area with shading is over 500 miles from the coast.

Seas, Gulfs, Peninsulas, Islands. Notice the three great gulfs, the Gulf of Mexico, in the south, between the peninsulas of Florida and Yucatan, Hudson Bay, in the north-west, almost shut in by the Labrador peninsula, and the long, narrow gulf of California, in the south-west, separating the peninsula of Lower California from the mainland. Notice also the four island groups, (1) the chain of the West Indies stretching from Yucatan to the South American end of the Caribbean Sea, (2) Newfoundland across the Gulf of the St. Lawrence, (3) the Northern Archipelago, of which Greenland and Baffin Land are the largest islands, and (4) the islands off the fiords of the northern part of the Pacific coast. The area of North and Central America and the West Indies

is about 9,600,000 sq. miles. Few parts are more than 1,000 miles from the coast. (See fig. 143.)

Relief. Look at the relief map of North America, on which are drawn lines at 600 feet below sea-level, and at

FIG. 144. Key to Physical Features of North America.

600 and 5000 feet above it. The highlands lie near the Atlantic and Pacific coasts, while the lowlands occupy the centre, or form narrow coastal plains. The continent may be divided into (1) the Western Mountains,

(2) the Eastern Highlands and Greenland, and (3) the Central Lowlands.

The centre of the Western Mountain system consists of a belt of plateaus of varying breadth, bordered east and west

FIG. 145. The Physical Features of North America.

by long and lofty mountain chains. The eastern chain is called the Rocky Mountains. The western chains are known as the Alaskan, Cascade, and Sierra Nevada Mountains. In the north the plateau is low and broad, forming the basin of the Yukon, to the south of which the Alaskan ranges rise

to peaks of 18,000 or 19,000 feet, with great glaciers and snow-fields. To the south the plateau is higher and narrower, forming the basins of the Fraser and Columbia rivers, which rise in the Rockies to the east, and break through the Cascades in magnificent gorges to the Pacific coast. South of the

FIG. 146. Grand Cañon of the Colorado River. After W. H. HOLMES.

Columbia, the plateau attains its greatest height between the Sierra Nevada on the west and the Rockies on the east. It is known as the Great Basin. Much of it is a basin of inland drainage, with Great Salt Lake in the east. The southern part of the Great Basin is drained by the Colorado river, flowing in gorges sometimes a mile deep, and so narrow

as to seem rather cracks in the earth than valleys (see fig. 146)[1]. Still farther south is the Mexican plateau, ending in a great chain of volcanoes, of which the highest is the nearly extinct Popocatapetl (figs. 144, 145).

Through the greater part of the western mountain system a third range can be traced to the west, sometimes as a Pacific coastal range on the mainland, sometimes in the islands, such as Vancouver, fringing the coast. It is separated from the western chain of the Alaskan, Cascade, and Sierra Nevada Mountains by valleys, or by narrow straits or sounds.

Look at the map and notice that at the eastern base of the Rockies the land is over 3,000 feet above sea-level. It slopes almost imperceptibly to the lowest line between Hudson Bay and the Gulf of Mexico, where it is rarely more than 600 feet high. To the east it rises gradually to the Eastern Highlands. Broadly speaking it forms a great plain extending from the Arctic Ocean to the Gulf of Mexico between the Eastern and Western Highlands, narrowing in the south where the continent tapers. It contains four great river basins, the Mackenzie, flowing to the Arctic Ocean, the Nelson flowing to Hudson Bay, the St. Lawrence flowing to the Atlantic, and the Missouri-Mississippi, flowing to the Gulf of Mexico. Notice the ring of lakes round Hudson Bay, most of which are drained by the Mackenzie, Nelson, and St. Lawrence. This part of the Central Lowland is a lakeland like that round the Baltic. The St. Lawrence drains the Great Lakes, Superior, Michigan, Huron, Erie and Ontario, the largest body of fresh water in the world. Notice that there are no lakes in the Mississippi basin.

The Eastern Highlands are divided by the St. Lawrence into the Labrador Highlands in the north, and the Appalachian Highlands in the south, with few points over 5,000 feet

[1] Deep narrow valleys of this kind are called in western America 'canyons.' The term is a convenient one to describe such valleys wherever they occur, as, for example, the valley of the Tarn in France or of the Orange in South Africa.

high. Both are densely forested. The Appalachians are bordered in the east by a coastal plain, which widens out to the south. It is crossed by a number of short but important rivers, the lower valleys of which are drowned by the sea, forming excellent harbours. Of these most important are the Hudson, Delaware, Susquehanna and Potomac, the last two forming the deep inlet, or drowned valley, of Chesapeake Bay.

Greenland is a vast island, about $\frac{1}{4}$ the size of Australia, lying almost entirely within the Arctic Circle. It is buried

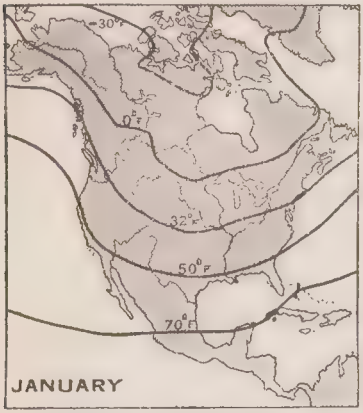


FIG. 147. The Mean Temperature of North America in January reduced to sea-level.

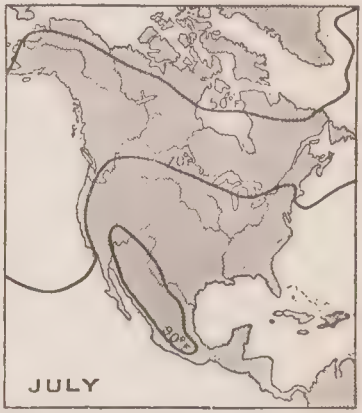


FIG. 148. The Mean Temperature of North America in July reduced to sea-level.

beneath a sheet of ice of unknown depth, except for a small strip on the south of the west side, to which it owes its name. In the interior it rises to a height of about 8,000 feet above sea-level.

Climate. North America, with its extension from north to south, and its great variety of elevation, has, like Asia, and for the same reasons, every variety of climate. In the extreme north and in Greenland the snow lies all the year round, and over a great part of the north the winter lasts from three to eight months. Look at fig. 147 and notice how large a part of the continent has a temperature below the freezing-point in

the month of January. In fig. 148, which shows the summer temperature, notice how far north the line of 50° extends. Thus a great part of the continent has an extreme climate with cold winters, and warm or hot summers. Notice that, in

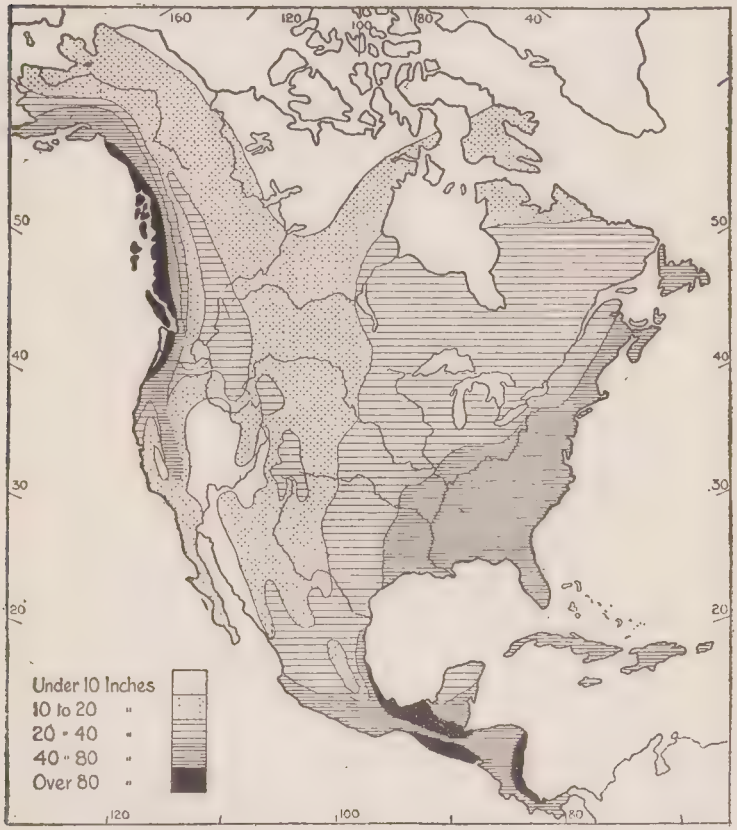


FIG. 149. Mean Annual Rainfall.

summer, as we should expect, the heat increases from the coast to the interior, and the highest summer temperature is found in the south-west of the central lowlands.

Look at the rainfall map in fig. 149, and notice that the east coast is wet from Newfoundland southwards. The rain-

fall diminishes slowly, but steadily, from the coast to the interior. West of the Mississippi the rain falls chiefly in summer, and is scanty. In the extreme west the lowlands become very dry. On the west coast the north has rain at all seasons, but most in winter (fig. 150). This is succeeded to the south by a belt 500 to 600 miles long with only winter rains, that is, a Mediterranean climate. The lofty western ranges of the Sierra Nevada prevent the winds from reach-

FIG. 150. Seasonal Distribution of Rainfall in North America.

ing the Great Basin, which is a rainless desert. Still farther south is the dry calm area, where deserts of great extent would occur, as in North Africa, if the continent were broad instead of very narrow. Southern Mexico and Central America lie in the region of summer rains immediately north of the equator.

Vegetation. The vegetation zones, like the climatic zones, correspond with those of the Old World. In the north are the unbroken ice and snow of Greenland and the islands of the Northern Archipelago, with the tundra to the south. Next

come the forests, scanty and dwarf on the tundra edge, but passing into magnificent forests of conifers further south. These again pass into mixed woods, which extend further south along the wetter coasts than in the drier interior. In

FIG. 151. Map showing the Distribution of Forests in North America.

the southern part, and along the east coast, they have been partly cleared for agriculture (see fig. 151).

Next come the steppe or grass lands, the richer eastern parts of which are called prairies in America. These become drier in the east, passing into desert in the south-west. Southern Mexico and Central America are rugged elevated lands, in which all zones occur, from the tropical forests on

the coastal plains to the tundra-like areas of the highest mountains, lying below the snow-line, where all vegetation ceases.

Animals. The animals of North America resemble those of the Old World. Large herds of cariboo, or reindeer, and moose, or elk, roam over the tundra. Beavers and other fur-bearing animals are found in the northern forests, and bears in the Rockies. Wild animals are not numerous outside the

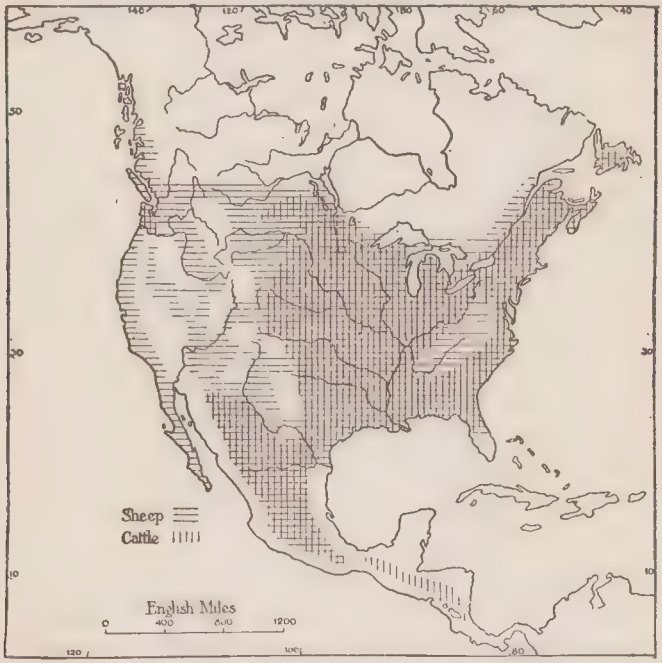


FIG. 152. Distribution of Sheep and Cattle in North America.

forest and western mountain areas. The important animals are the domestic animals of the Old World, sheep, cattle, pigs, and horses, which are kept in immense numbers (fig. 152).

Minerals. Minerals are abundant in the western mountains, and the Eastern Highlands. Coal and petroleum are found in the lowlands.

Occupations. The occupations carried on in North America resemble those of Europe. Lumbering is extremely im-

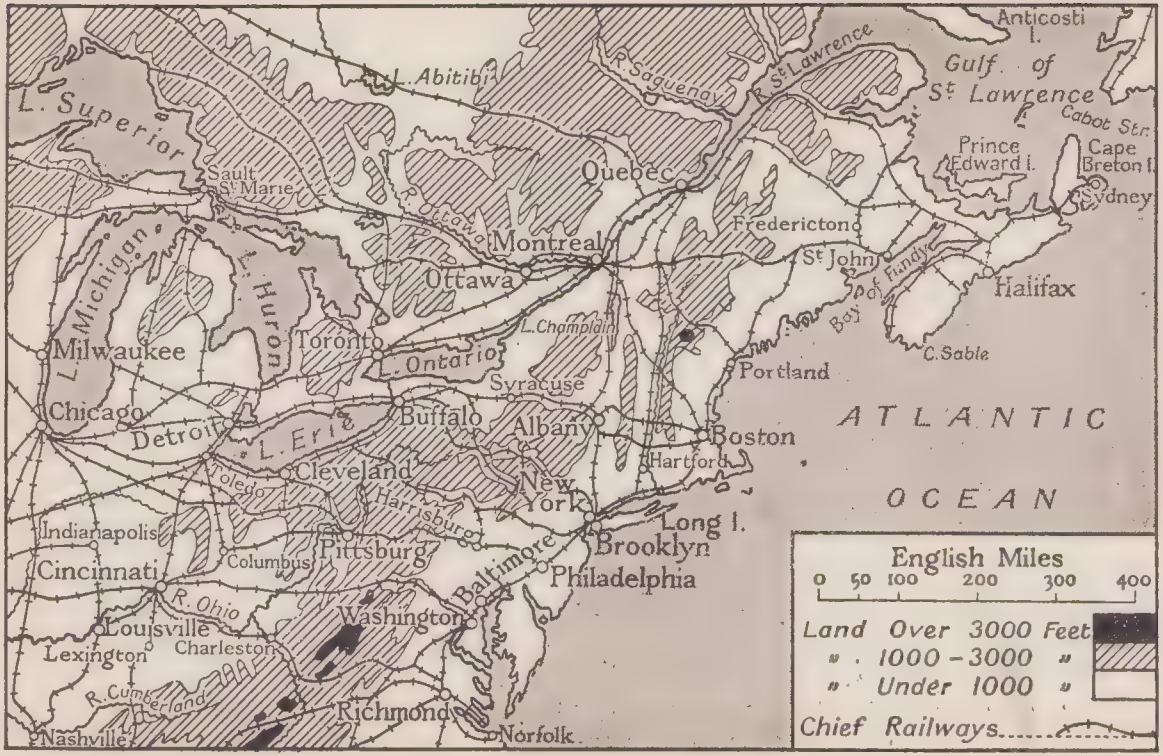


FIG. 153. Routes from the Great Lakes to the Atlantic.

portant in Canada, where the lumbermen go to the forests in winter to cut trees, which are dragged over the frozen ground to the river, to be floated down in spring. Fisheries are important on both the Atlantic and Pacific coasts, as well as in the Arctic waters. The Central Lowland is agricultural in the east and south, and pastoral in the drier west. The Atlantic seaboard is densely peopled, with large and busy manufacturing cities, wherever coal and water power are available, and numerous ports along the coast. The Pacific seaboard is less developed, but there are several important ports. Several lines of railway cross North America from ocean to ocean. The eastern part of the continent is covered by a network of lines, connecting all the important towns with each other (fig. 154).

Peoples. When discovered by Europeans America was inhabited by a coppery brown, straight-haired race, called by the settlers Redskins or Red Indians. They depended for their living partly on agriculture, but chiefly on hunting the bison, which roamed in immense herds across the steppes. The bison have wholly, the red men largely, disappeared before the white man, and are now found only in special reservations in the plains, and in the mountains of the north and south. The Europeans who have replaced them are chiefly of Spanish descent in the south, and of British descent, with a considerable intermixture from the continent of Europe, in the centre and north. There is a large population of French descent round the St. Lawrence. In the southern states are several millions of negroes, the descendants of slaves imported from Africa, chiefly in the seventeenth and eighteenth centuries, to work at agriculture in the hot south.

Political Divisions. The British lands of Canada and Newfoundland occupy the whole of the north, except Alaska in the north-west, which belongs to the United States. The Federal Republic of the United States stretches across the centre of the continent, from the Atlantic to the Pacific, and from British America to the frontiers of Mexico. The Re-

XXV. Southern Alps of New Zealand

XXVI. Honolulu, Hawaii

XXVII. The St. Lawrence at Quebec: summer

XXVIII. A St. Lawrence tributary in winter: Rideau Falls

public of Mexico occupies the tapering southern portion of the continent between the Atlantic and the Pacific. Central America is divided between a number of small republics. The West Indies are divided among several powers. Cuba, the largest, is a republic protected by the United States.

BRITISH NORTH AMERICA.

British North America (area about 3,800,000 square miles) consists of the Dominion of Canada (9,000,000 inhabitants) on the mainland, and the island colony of Newfoundland, which includes the east coast of Labrador on the mainland.

Canada. Canada is bounded north by the United States territory of Alaska, and the Arctic Ocean; and by the Pacific and Arctic Oceans on the west and east. The southern or United States boundary corresponds with no natural feature, except the Great Lakes, the northern shores of which are Canadian.

The surface of Canada consists of a western mountain area, a central plain partly submerged by Hudson Bay, and highlands in the east. The northern part of the mountainous west forms the Yukon basin, a frozen land, with thin scrub on the hill sides. The discovery of the rich gold-fields of the Klondike created Dawson City, which is reached by rail from Skagway through United States territory. The Klondike gold-fields can only be reached from Canada over difficult passes which are inaccessible for much of the year. South of the Yukon the land is a sea of mountains, with deep forested valleys very difficult to penetrate. On the Pacific coast these descend to deep fiords, bordered by islands, of which the most important is Vancouver, with Victoria, the capital of British Columbia, the mountain state of Canada. Vancouver, on the mainland, on an inlet near the mouth of the Fraser, is the Pacific terminus of the Canadian Pacific Railway. The line is carried up the western slopes of the mountains by the gorge of the Fraser, and then crosses the parallel Gold, Selkirk and Rocky Mountains, through magnificent scenery of snow peak, glacier, pine forests, deep gorges, and roaring torrents.

The floors of the valleys are fertile but thinly settled. In the eastern ranges gold, silver, and coal are abundant, and branch lines run to the mining districts. The main line descends the eastern slopes of the Rockies to the plains, which are here too dry for agriculture, and form great cattle ranches, or ranges. The winds which blow over them are dry, having parted with their moisture on the western slopes, and as they descend they become warm. Where these 'chinook' winds blow in spring the temperature rises rapidly, and snow disappears as if by magic[1]. Towns are few in this part of the plains, which has only been settled since the railway was made. The line follows the valley of the Saskatchewan, the main stream of the Nelson, to the agricultural eastern plains. Here the cold is great in winter and the soil frozen, but when the spring thaws come wheat roots quickly in the moist soil. Light rains fall in early summer, when the ear is filling, and abundant sun ripens it. Manitoba, and particularly the lake plain crossed by the Red River valley, is covered in summer with ripening wheat as far as the eye can reach. At the stations great elevators are built, to which the grain is brought, to be carried eastward. Towns become numerous, the largest being Winnipeg, on the Red River, near Lake Winnipeg. Fig. 154 shows the new main lines (i) to Vancouver, (ii) to Prince Rupert, through fertile districts which are being rapidly settled. With its fertile soil, and numerous navigable rivers and lakes, it will become a prosperous agricultural region. East of Manitoba the lines enter the forest area. At Fort William and Port Arthur, on Lake Superior, steamers are loaded with grain for the ports of East Canada and Europe. Ottawa, on the Ottawa River, the Dominion capital, has a great lumber trade and many saw-mills driven by water power from the Chaudière Falls. Montreal, on an island, where the Ottawa enters

[1] When water vapour passes into water heat is set free and the temperature rises. The warm föhn winds of the Alps, called by the Swiss 'snow-eaters,' are due to the same cause. In New Zealand similar winds, the nor'westers, blow over the Canterbury plains.

the St. Lawrence (see fig. 153), is the chief commercial and manufacturing centre of Canada, and the busiest port, shipping the produce of its forests, ranches, and wheat lands, and the fruit and dairy produce of the Lake Peninsula. This, the richest part of Canada, lies between Lakes Huron, Erie and Ontario, in the latitude of Southern France. It is covered with vineyards, orchards, market gardens, and dairy farms. Special fruit trains carry its

FIG. 154. Main Railway Routes of Canada and the United States of America.

fruits and vegetables to the market centres. Toronto, on Lake Ontario, is the chief town and manufacturing centre. Many busy towns lie on or near the northern shores of Ontario. Between Erie and Ontario are the famous Niagara Falls. To avoid them the Welland Canal has been cut. Another canal, the Soo, or Sault Sainte Marie, avoids rapids between Superior and Huron. With the aid of these canals there is through connexion by the Great Lakes and St. Lawrence between Fort William and the ports on both sides of the Atlantic. Large ocean steamers come up the St. Lawrence as far as

Montreal. At the head of the estuary is Quebec, finely built on heights commanding the river. In the fertile district south of the St. Lawrence, between Montreal and Quebec, a number of small manufacturing towns have grown up.

North of the St. Lawrence and the Great Lakes lumbering is the chief occupation. The Labrador peninsula, and the country round Hudson Bay, a land of lakes and forests, is visited only by hunters and fur traders.

New Brunswick, south of the St. Lawrence, is a forested hilly land, with fertile valleys. St. John, the capital, is a lumber and fishing port. The peninsula of Nova Scotia and Cape Breton Island are also forested, with rich pastures and orchards round Fundy Bay, which is remarkable for its high tides. The capital is Halifax, with a magnificent harbour. As the St. Lawrence is frozen in winter Halifax and St. John, which are ice free, are of great importance to Canadian trade. The mineral wealth of these eastern provinces is great. Nova Scotia has large coal-fields, especially round Sydney, in Cape Breton Island, with great iron works. Prince Edward Island is covered with orchards and market gardens.

Newfoundland. Newfoundland is an undulating land of lake and forest. Its mineral wealth is great but undeveloped. Its cod and other fisheries are among the most important in the world. Fishing fleets sail from St. John's, to the seal and whale fisheries of Labrador, Greenland and the Arctic Seas.

THE UNITED STATES.

The United States (area about 3,000,000 square miles; 106,000,000 inhabitants), like Canada, consists of mountains in the west, plains in the centre, and highlands in the east. The mountain area is broader than in Canada. The Pacific is bordered by a coastal range, behind which are long fertile valleys, the rivers of which, like those of British Columbia, have famous salmon fisheries. In the north, opening to Puget Sound, are rich wheat lands. The largest town is Portland, on the estuary of the Columbia. The Californian valley to

the south is drained by the Sacramento. It produces wheat in the north, and in the south vines, peaches, oranges and other Mediterranean fruits. San Francisco, with a magnificent harbour, is the capital, the terminus of the southern lines from the Atlantic (see fig. 154), the chief Pacific port, and the starting point for routes to China, Japan and Australia, by Honolulu.

East of the Cascade and Sierra Nevada mountains are the arid volcanic plateaus of the Snake basin, and the desert ranges of the Great Basin. Round Great Salt Lake irrigation has received great attention, and Salt Lake City has a large population. Arizona, and New Mexico, on the Mexican frontier, are desert lands, with cliffs and isolated flat-topped hills, of strangely weathered and fantastically coloured rocks. The rivers run in deep canyons, and are often dry. All round the mountains minerals are abundant, especially gold, silver and copper, but the aridity of the country makes it difficult to develop them. The scenery of the Cascades and Rockies is much less imposing than that of the Canadian ranges. The snow-line is higher, the peaks barer, and the forests thinner. Exceptionally beautiful areas are the Yosemite valley, in California, and the Yellowstone Basin, where a large tract, containing geysers, mud volcanoes, terraces and other rare formations, has been set apart as a national park. The whole mountain region is thinly peopled. The largest town is Denver, at the eastern base of the Rockies.

East of the Rockies is the Central plain, which consists almost entirely of the Missouri-Mississippi basin. Look at figs. 144 and 145, and notice that the Mississippi rises at no great height near the Canadian frontier, west of Lake Superior, and flows almost due south to the Gulf of Mexico. Great tributaries come in on both banks. The largest of these on the right bank is the Missouri, which rises in the Rockies, and has a much longer course than the main stream. Both the Missouri and the Mississippi receive many tributaries from the Rockies, flowing east in long parallel valleys. On the left bank the chief tributary is the Ohio, which rises near the east

end of Lake Erie, and with its tributaries drains the western slopes of the Appalachians. Below the confluence of the Ohio the Mississippi flows south as a broad stream, with high embankments, or *levées*, along its banks to prevent it from flooding the low-lying lands on either side. It enters the sea by a great delta. There is much variety in the products of this vast basin, which includes more than 1,000,000 sq. miles. The upper and middle courses of the western tributary cross the drier western plains, where stock raising is all important. Their lower courses and the eastern tributaries are in the agricultural belt, where wheat is grown in the north and maize in the centre. In the hotter south these cereals are replaced by cotton, tobacco, rice, &c. Most of the wheat is sent to Duluth, on Lake Superior, or Chicago, on Lake Michigan, to be shipped to the east, and Europe. Much, however, is converted into flour. Minneapolis, at St. Anthony's Falls, on the upper Mississippi, is the great milling centre. Of the many busy towns of the Mississippi notice St. Louis, at the confluence of the Missouri, in the centre of the maize zone (fig. 154). St. Louis, Chicago, and other towns of the Mississippi, such as Omaha, are centres to which the live stock of the western ranches, and the hogs fattened on the maize lands, are sent for slaughter and distribution. New Orleans, on the delta, 100 miles from the sea, is the great cotton market and port. Many other gulf ports, of which Mobile may be noted, are engaged in the same trade.

South of the Great Lakes is one of the greatest coal-fields in the world, covered with manufacturing towns, of which Chicago, and Cincinnati and Pittsburg, on the upper Ohio are the most important. Iron is brought from Lake Superior to Cleveland and other lake ports, and manufactured in Pittsburg and the district. The wooded Appalachians, with isolated but fertile valleys, are still thinly peopled, except between the upper Ohio and the Atlantic, where coal is abundant (fig. 155).

In New England the rivers from the highlands supply water-power to many busy manufacturing towns. The most important of these is Boston, in Massachusetts, a great port.

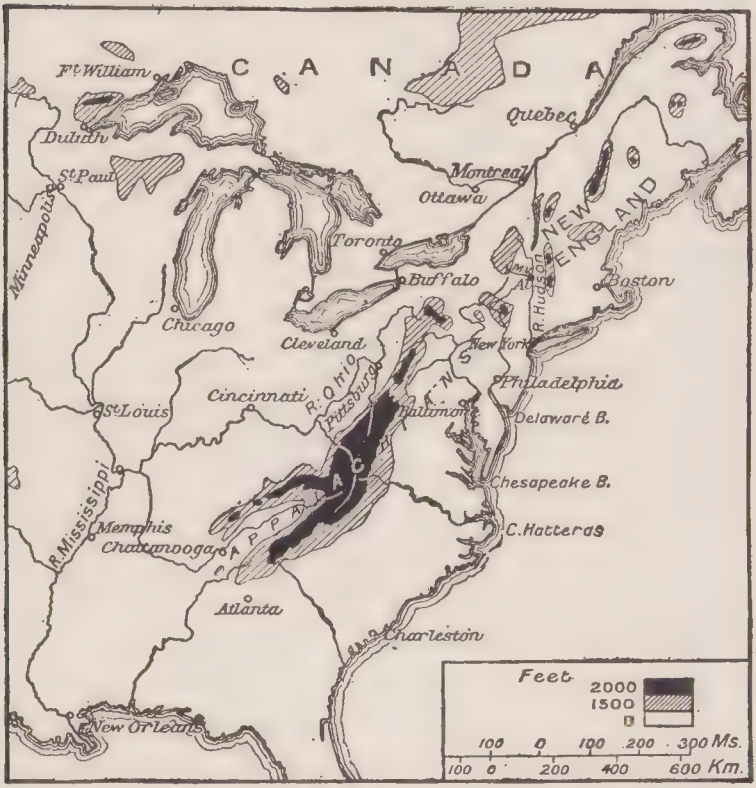


FIG. 155. The Appalachian Mountains.

Look at figs. 145 and 155, and notice carefully, immediately to the east of New England, the valley of the Hudson, continued by Lake Champlain, running due north to the St. Lawrence

near Montreal. In the middle of the Hudson valley the Mohawk valley enters from the west, forming a natural route through the mountains to Lake Ontario and the west. The position of New York at the end of this Hudson-Mohawk route has been one of the chief causes of its importance. By this route are brought the agricultural and manufactured products of the interior, to be shipped from New York, on an island at the mouth of the Hudson, and now extending over the neighbouring islands and coasts. New York has a population of 4,000,000, and is the greatest city in the world after London. Other important Atlantic ports are Philadelphia, an engineering and manufacturing centre, at the mouth of the Delaware, and Baltimore on Chesapeake Bay. South of Baltimore is Washington, the Federal capital, and the seat of the legislature and administration. South of Chesapeake Bay the coastal plain widens into a considerable lowland, which is continuous south of the Appalachians with the Central Plain. In the north tobacco and maize and in the south cotton and rice are the chief crops. The Atlantic coast is bordered by swamps and lagoons south of Chesapeake Bay, and in Florida, where orange groves and fruit orchards cover large areas.

Alaska, a territory of the United States, is a mountainous land, highest in the south. It is valuable chiefly for its copper and its gold, which is found in the sands of sea and river as well as in the rocks. The Yukon is navigable for a few months in summer, and is the chief means of communication. The capital is Juneau in the south. Off the Alaskan coast and in the Bering Sea are important seal and salmon fisheries.

MEXICO.

The republic of Mexico (area about 767,000 sq. miles) occupies a plateau, rising east and west to lofty mountains continuous with the Rocky Mountains, and to a volcanic chain which borders it in the south (fig. 145). Beyond the isthmus of Tehuantepec and the Yucatan peninsula are

lowlands. The coast is sandy and good harbours are few. Vera Cruz, in the south-east, is the best.

The tropic of Cancer crosses southern Mexico, which receives little rain in the interior. Its varied elevation gives it several zones of climate. Along the coast and up to 3,000 feet is the hot belt (*tierra caliente*), producing tropical products. The coco-nut flourishes near the sea, mahogany and other fancy woods, logwood and other dye woods, are found in the forests. Hemp, sugar, cotton, cacao and tobacco are largely cultivated. In the warm zone (*tierra templada*), between 3,000 and 7,000

FIG. 156. Plant Products of Mexico, Central America, the West Indies, and Venezuela.

feet, coffee, bananas, rice, sugar, cinchona, oranges and other southern fruits, maize and other cereals are grown where there is sufficient moisture for irrigation. Aloes and cactuses are characteristic plants in the drier parts. Above 7,000 feet, in the cool zone (*tierra fria*), cereals are grown (fig. 156).

The mineral wealth of Mexico is very great, especially in silver. The railways climb from the coast to the plateau, and run from the volcanic range north to the United States. An important line crosses the isthmus of Techuantepec. The capital is Mexico, on a high plain, near the base of Popocatapetl. Guadalajara, Pueblo and other large towns

have grown up in the silver districts. Vera Cruz and Tampico are the chief ports on the Atlantic, and Mazatlan on the Pacific coast. There are great oil-fields near Tampico.

CENTRAL AMERICA.

The small republics of Guatemala, Honduras, Salvador, Nicaragua, Panama, and Costa Rica, with British Honduras, occupy the narrow neck of Central America (area about 173,000 sq. miles). They lie entirely within the tropics, and receive abundant rains, mainly in summer, and heaviest in the east except in the extreme south, where the west is also very wet. The wet slopes are the most densely forested (fig. 149). As in Mexico three vertical zones—hot, warm, and cool—can be distinguished. The lower hot belt is covered with dense forests, producing coco-nuts, rubber, mahogany, bananas, pineapples, and other fruits. Cotton is grown in the lower grounds, and cacao on the hill slopes. The temperate lands are also forested, but the drier parts are grass lands where cattle are kept. Coffee and tobacco are grown in the warm zone. In the cool lands, wheat and potatoes are grown. The west is the cultivated and most populous side (fig. 156). The Panama isthmus is more than 40 miles wide, and across it a great ship canal has been constructed joining the Atlantic to the Pacific.

THE WEST INDIES.

The West Indies consist of the large islands of Cuba, Jamaica, Hispaniola and Porto Rico, forming the Great Antilles, and of many smaller islands forming the Lesser Antilles. All of them are mountainous, many of them volcanic, and most of them densely forested, especially on their eastern slopes. The climate is tropical, with rains in summer and autumn. Sugar is the most important product, but tobacco, coffee, bananas and other products are increasing in importance.

Cuba, a republic under the protection of the United States, is nearly as large as England. It is densely forested.

Among the forest trees are many species of palms, mahogany, and many tropical fruit trees. Sugar and tobacco are the chief cultivated crops. The capital is Havana.

Hispaniola is divided into the republics of Haiti and San Domingo, producing sugar, cotton, &c.

Porto Rico is a mountainous possession of the United States. It has grass lands on the upper slopes, where the forests have been cleared, and plantations of sugar and coffee at lower levels.

Jamaica is a mountainous island, with numerous rivers. It produces excellent coffee, especially on the Blue mountains in the east, sugar, cacao, ginger, allspice, tobacco, and many varieties of fruit. The export of bananas is becoming very important. Kingston is the chief town and port.

The other British islands are grouped into the (*a*) low Bahama coral islands, producing pineapples and sisal hemp; (*b*) the Leeward Islands, of which Antigua, the seat of government, with fields of sugar-cane and pineapples, and the mountainous island of Dominica yielding coffee, are the chief; (*c*) the forested volcanic Windward islands, St. Lucia, St. Vincent and Grenada, producing sugar and cacao; (*d*) Barbados, dotted with the sugar plantations of its negro inhabitants; and (*e*) Trinidad, close to the South American coast, important for cacao, and for asphalte derived from a great pitch lake.

SOUTH AMERICA.

Position. Notice that the continent of South America is broadest in the north and tapers to the south. It lies farther south than Africa, stretching between 12° N. and 55° S., if we include the islands forming the southern extremity, of which the largest is Tierra del Fuego, separated from the mainland by Magellan Strait. It is surrounded on all sides by the sea, except in the north, where it joins the narrow neck of Central America. The Pacific washes its western and the Atlantic its southern shores. Its area is about 7,000,000

sq. miles. Notice in fig. 157 that no part is 1,000 miles from the sea.

Relief. Look at figs. 158 and 159, which show the lines from 600 feet below sea-level, and for 600, 3,000, and 6,000 feet above. Notice that the general arrangement of highlands and lowlands is the same as in North America. There is a high mountain area in the west, lowlands in the centre, and highlands in the east.

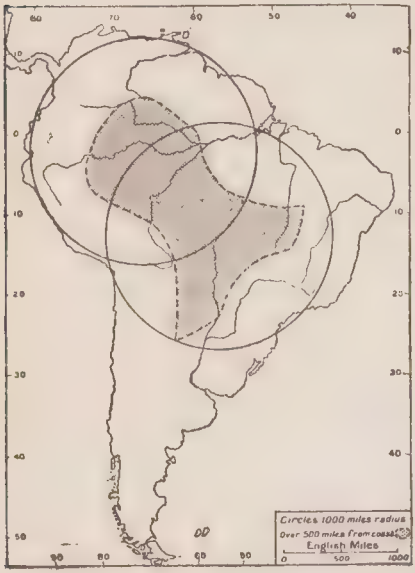


FIG. 157. Distances from the Sea.

The proportion of lowland is greater in South America than in any other continent except Europe, and the proportion of land over 10,000 feet is also greater than in any other continent except Asia.

The western mountain area, or Andes, is narrower and higher than that of North America. In the north three ranges from the Caribbean Sea converge to the high narrow plateau of Ecuador, which lies about 8,000 feet above the sea. This is bordered by lofty ranges, averaging about 12,000 feet in height, but rising in Chimborazo to over 20,000 feet, and almost as high in the volcanic cone of Cotopaxi. Other magnificent snow peaks rise from 17,000 to over 19,000 feet, including several volcanoes. Both the Atlantic and Pacific slopes are densely forested. South of Ecuador the Andes of Peru are still threefold, with a high cold plateau between the western and central chains, and a broader and more fertile region between the central and eastern ranges. The height

of the chains is about 13,000 feet, with peaks rising to 19,000 feet. In this section rise the Amazon and its tributaries. Bolivia, to the south, is a high plateau, about 12,000 feet above the sea, and enclosed by lofty ranges which contain some of the highest peaks in South America. Sorata and other peaks rise to nearly 22,000 feet. Lake Titicaca, in the north-eastern part of the plateau, is a basin of inland drainage. South of the Bolivian plateau the ranges converge to one main chain, where Aconcagua, the loftiest mountain of the New World, rises to over 23,000 feet. South of it is the Uspallata, or Cumbre Pass, from Argentina, on the east, to Chile on the west, one of the most important passes in the Andes, and the route taken by a trans-continental railway line in course of construction. The range continues to the south with snow peaks, volcanic cones and glaciers, the eastern valleys containing numerous lakes, and the western slopes forming fiords and islands.

The coastal range is not always so well marked as in North America. Notice the valley of Chile, between the Andes and the coast range. It may be compared with the valley of California, while the sounds and islands of Southern Chile recall British Columbia.

The Eastern Highlands consist of the Guiana Highlands in the north-east, separated by the Amazon basin from the Highlands of Brazil. Both are forested tablelands, cut by deep gorges, to which the rivers descend in magnificent falls. The Brazilian Highlands rise steeply from the Atlantic and slope to the west.

The plain between the Andes and the Eastern Highlands is drained by three great rivers, the Orinoco, between the Andes and the Guiana Highlands, the Amazon, between the Guiana and Brazilian Highlands, and the Paraguay-Parana, south of the Brazilian Highlands (figs. 158, 159).

The Orinoco rises in the tropical forests of the Guiana Highlands and divides into two branches. Notice that one of these, the Cassiquiare, flows to the Negro, a tributary

of the Amazon, connecting the two river systems. The main stream of the Orinoco flows round the western base of the Guiana Highlands, receiving many long, parallel tributaries from the west, navigable to the base of the Andes, which

FIG. 158. The Physical Features of South America.

descend very steeply to the lowlands. The river crosses the llanos, or savana lands of Venezuela, and enters the sea by a great delta, through densely forested swamps.

The Amazon rises in the Andes of Peru, by two main streams, the Marañon, between the western and central Andes

FIG. 159. Key to Relief Map of South America.

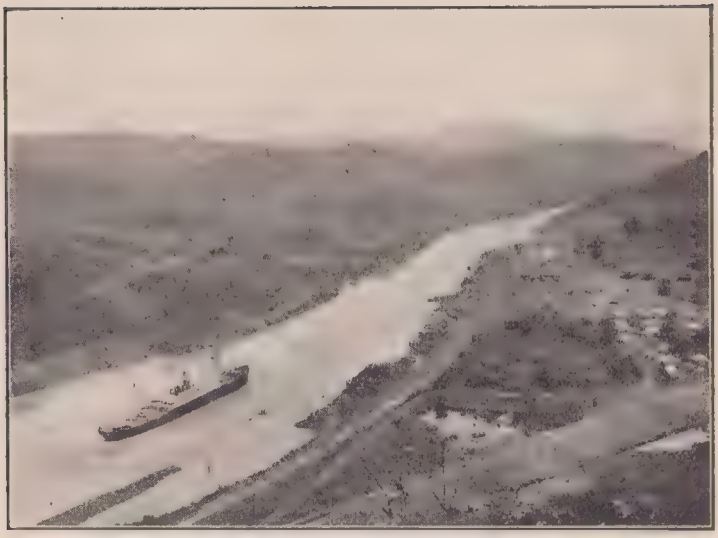
of Peru, and the Ucayali, which rises farther south in the eastern chain. The Marañon cuts its way through the two outer ranges of the Andes, and joins the Ucayali, both rivers forming numerous falls and rapids, as they descend the steep forested slopes to the plains. The united river is navigable for the remainder of its course, a distance of over 3,000 miles. It receives many tributaries from the Andes of Ecuador, Peru, and Bolivia, the largest being the Rio Negro on the left bank, and the Rio Madeira on the right bank. Both are immense rivers, and the Amazon itself is as broad as an inland sea. In places its depth is as much as 120 feet, and the volume of water it carries to the ocean is enormous. For the whole of its course it flows through dense tropical forests, often breaking up into parallel streams, and bearing innumerable forested islands on its broad waters. It enters the ocean by a great estuary, up which the tides rush with extreme violence. The influence of the Amazon itself can be seen and felt for a great distance out to sea. The estuary is nearly filled by the island of Marajo, not much smaller than Scotland. Notice in the map the Para river, the channel generally used for ships entering the Amazon, and the Tocantins, from the Brazilian Highlands, which enters it.

Look at the map and notice how low the land is which separates the basins of the Amazon and the Parana-Paraguay. In the wet season the two systems are joined. The Paraguay flows south through open forests, receiving the Parana from the open forests of the Brazilian Highlands. The united river flows through the grass land or pampas of Argentina, and turns south to the Plate estuary, or Rio de la Plata. Notice the Uruguay, which also flows to the Plate estuary almost in the same line as the middle Parana.

Besides these great rivers two others should be noticed, the Magdalena, with its tributary the Cauca, both flowing in long parallel gorges from the Andes of Ecuador, north to the Caribbean Sea, and the São Francisco, which rises in the

XXIX. Kicking Horse Pass, Rocky Mountains : Canadian Pacific Railway

XXX. Eastern highlands of U.S.A. : the Adirondacks



XXXI. Panama Canal

XXXII. Brazilian Highlands near Rio de Janeiro

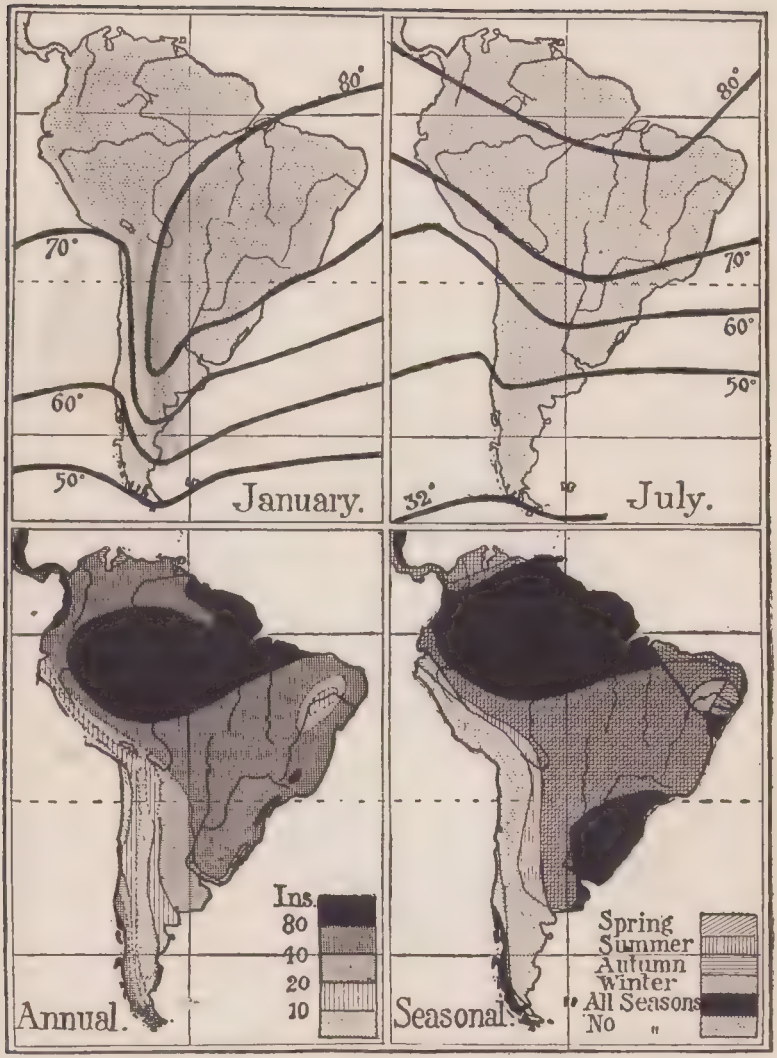


FIG. 160. Mean Temperature of South America in January reduced to sea-level.
FIG. 161. Mean Temperature of South America in July reduced to sea-level.
FIG. 162. Mean Annual Rainfall.
FIG. 163. Seasonal Distribution of Rainfall in South America.

south of the Brazilian Highlands and flows north and east to the Atlantic.

South of the Plate estuary a number of short rivers drain the eastern slopes of the Andes, not all of which reach the ocean.

Climate and Products. Notice that South America is broadest immediately south of the equator, just where South Africa contracts in width. Also that the greater part of the land lies within the tropics, but that south of the tropic of Capricorn it tapers rapidly. Over the greater part of the continent, therefore, the temperature is high at all seasons, and except in the mountain area, where the hot, warm and cool belts are found, there is no great range of temperature. Notice that in the lowlands the greatest range of temperature is found in the upper Paraguay basin (figs. 160, 161). South of the tropic of Capricorn the temperature gradually falls, and in the extreme south, in the latitude of Ireland, the temperature generally resembles that of Ireland.

Look at the rainfall map in fig. 162 and notice in the lands east of the Andes the great breadth of the equatorial rain belt, which is the largest area of heaviest rains in the world, and also that the Andes form a barrier to the trade winds. The enormous volume of the Amazon and the density of the tropical forests are both due to the immense rainfall of this region. It would be impossible to give any idea of the richness of this forest, the extent of which is little less than that of Europe. Rubber is an important product. Palms, figs, mimosa, and bamboo are characteristic trees, and these are covered with creepers and parasites of many descriptions. This great forest area—the selvas—is still little known, except round the rivers, and the density of its vegetation makes it very difficult to penetrate. North and south of this belt of equatorial rains and dense forests are regions with summer rains, forming opener woods, as in the campos of Brazil, and savanas, as in the llanos of the Orinoco or the pampas of the Plate basin. These belts may be compared with the corresponding belts in

Africa. In the extreme south the country is drier, with slight winter rains on the coast. West of the Andes, from the Gulf of Guayaquil northwards, rain is abundant, but southward the western coast, lying in the lee of the trade winds, is a rainless

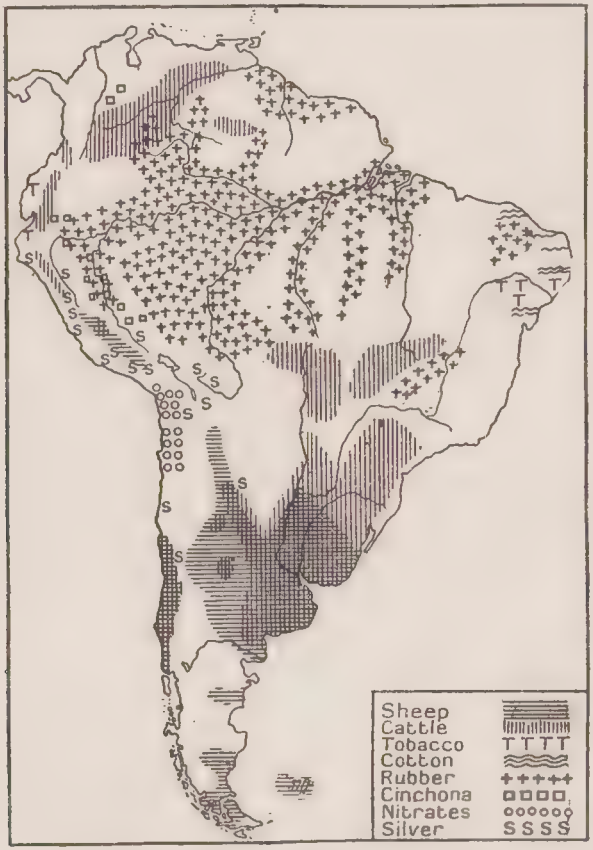


FIG. 164. Products of South America.

desert, corresponding in position with the Kalahari and Australian deserts, but extremely narrow, owing to the near approach of the Andes to the sea. The Chilean valley has the Mediterranean climate of dry summers and winter rains. South

of 42°, where the coastal range breaks up into islands, rain falls at all seasons of the year, as in British Columbia, or northern Europe. Evergreen pine woods clothe the slopes of the mountains. On the eastern slopes, where little rain falls, are

FIG. 165. Food Products of South America.

the thorny scrub lands of Patagonia. The seasonal distribution of rain is shown in fig. 163.

Many of the animals of South America are peculiar to that continent. Neither the elephant nor the hippopotamus of the

Old World are found. The lion is represented by the puma, and the tiger by the jaguar. The llama, or South American camel, is used on the high passes of the Andes, as the yak is used in Tibet. The alpaca, belonging to the same family, domesticated for its wool, is also found in the Andes, in which the characteristic bird is the great condor. Many exquisite small birds flit through the tropical forest, including the humming-bird and the bird of paradise.

The domesticated animals of Europe have been introduced outside the forest and mountain area, and sheep, cattle, and horses are kept in large numbers on the pampas (fig. 164).

Occupations. South America contains but a small part of the population which its enormous natural resources could support. The inhabitants number about 50,000,000 and are at all stages of civilization. In the tropical forests are wandering tribes, ignorant of agriculture and the arts of life, who live by fishing and gathering forest produce. At the other extreme are the great cities of Rio Janeiro or Buenos Aires, with enormous populations, flourishing industries, and all the conveniences of the modern world. The forest is yet little utilized, except for the collection of rubber. The grass lands are among the great stock-rearing regions of the world. Agriculture is carried on all round the margin of the continent, as well as on the mountain slopes and plateaus, and in the lowlands of the Magdalena and Plate basin. For the chief plants cultivated see fig. 165. Manufactures are little developed, but are growing in the large cities.

Races. The bulk of the white population is of Spanish descent on the eastern, and of Portuguese descent on the western side of the continent, with a considerable proportion of Germans in Brazil, and of British in British Guiana, Chile and Argentina. Both Spanish and Portuguese have intermarried with the native Indians, forming a mixed race. The Indian tribes are more numerous than in North America, especially in the mountains and forests. They are at all levels of civilization.

Political Divisions. The Andes form the states of Colombia, Ecuador, Peru, Bolivia, and Chile. East of Chile extends the great lowland country of Argentina, with the smaller states of Uruguay and Paraguay, round the rivers of the same name. Brazil occupies in the north-east an area equal to that of

FIG. 166. Railways and Waterways in South America.

Europe. On the north lie Venezuela, and British, Dutch, and French Guiana. Except the three last all are republics. The chief towns and routes are shown in fig. 166.

Colombia. Colombia (500,000 sq. miles) consists of a

coastal strip, a high Andean region, the lowlands of the Magdalena and Cauca, and the llanos in the east. The coast and Andean region have four climate and vegetation zones, (1) the hot belt with sugar, cacao, and tropical fruits up to 3,000 feet, (2) the warm belt with temperate products, well suited to coffee and maize, up to 6,500 feet; (3) the cool belt, up to 10,000 feet suited for northern fruits and cereals; (4) the treeless paramos, over 10,000 feet. Cattle are kept on the llanos, round the Cauca, and on the lofty plateau of Bogota. Railways hardly exist, roads are bad, and the Magdalena is the chief means of communication with the interior. The capital is Bogota, nearly two miles above sea level.

Ecuador. Ecuador (120,000 sq. miles) consists of the coast and Andean area, the eastern slopes of which descend to the tropical forests of the Amazon basin. In climate and productions it resembles Colombia. Both east and west are densely forested, except in the higher parts. The cinchona tree is of great importance for the manufacture of quinine. A railway climbs from Guayaquil on the coast to Quito, over 9,000 feet above the sea.

Peru. Peru (460,000 sq. miles) consists of the coast, the Andean area, rich in minerals, and tropical forests in the Amazon basin. The coast is a desert, crossed by fertile valleys, in which are grown cotton, sugar, tobacco, rice, &c. Alpacas and vicunas are numerous in the mountains, producing excellent wool. The eastern forests supply cinchona and rubber, and cacao is largely cultivated. Mining, especially silver and copper, is important in many parts of the mountain area. Railways climb from the coast to Pasco, the centre of the silver district, and to Lake Titicaca on the Bolivian plateau. The capital is Lima, with Callao as its port.

Bolivia. Bolivia (570,000 sq. miles) has no coastal area, but consists of the Andean region in the west, and of the forested Amazon lowlands in the east. Mining (for tin, &c.) is important in many parts. Alpacas and vicunas yield much wool. The eastern valleys produce cinchona and the finest

qualities of cacao and coffee. In the forests rubber is an important product. The chief town is La Paz, near Lake Titicaca, the centre of the cinchona trade. From Southern Bolivia a line runs over the southern Andes, to Antofagasta, in Northern Chile.

Chile. Chile (295,000 sq. miles) is a long narrow country, larger than any European country but Russia. The northern part of it consists of the Atacama desert, from which are obtained large quantities of nitrates, one of the best fertilizers known. The valley of Chile is very fertile, producing Mediterranean fruits and cereals, of which the vine, grown for wine and raisins, is the most important. In the centre is the capital, Santiago, a handsome modern city, connected by a railway over the coastal range with its port, Valparaiso, Concepcion is the chief town in the south, near a coal-field. Punta Arenas, in the south, is in a gold-mining, sheep-rearing district. The southern fisheries are important. Much of Chile, especially in the forested areas, is undeveloped, but the country is advancing rapidly. A trans-continental railway to the Plate estuary crosses the Andes by a tunnel under the Uspallata Pass.

Argentina (1,800,000 sq. miles), **Paraguay** (140,000 sq. miles), and **Uruguay** (72,000 sq. miles) the countries of the Plate basin, together occupy an area half the size of Europe. At the western foot of the Andes the climate is arid. In the south the chinook winds clear the ground of snow and allow of stock raising. The north is too hot and dry for cultivation, except under irrigation, when sugar, tobacco, the vine and other southern fruits can be grown, round Tucuman and other centres. On the pampas vast quantities of stock are kept, and the making of meat extract is an important industry. The eastern part, round the Parana and Uruguay, is a great wheat and maize growing region. Large quantities of cereals are exported, from Rosario on the Plate estuary, Buenos Aires, the capital of Argentina, La Plata, and Montevideo, the capital of Uruguay. The capital of Paraguay is Asuncion.

The railways of Argentina are well developed, connecting all the important centres. The trans-continental line is carried by Mendoza to Las Cuevas, at the Argentine end of the tunnel under the Andes.

The Falkland islands (6,500 sq. miles), off the extreme south-east of Argentina, are British. The climate is cold and rainy. Sheep-rearing is the principal occupation. Port Stanley, on the eastern of the two islands, is the chief town.

Brazil. Brazil (3,300,000 sq. miles) lies between the tropics, except in the extreme south. The greater part of it is occupied by the vast Amazon forest, the rest by the savanas and campos of the Brazilian Highlands. The vast forested interior is little developed, and large areas are not even explored. Cattle are kept in the southern savanas. The highland margin, round São Paulo, is a coffee-growing district, the port of which is Santos. The towns are almost all on the coast, though Manaos, at the confluence of the Amazon and Negro, is an important port. Para, or Belem, at the mouth of the Para river, is the great port for rubber and forest produce. Pernambuco, and Bahia or San Salvador, are the ports for the agricultural districts, in which sugar, cacao and tobacco are grown. The capital is Rio de Janeiro, one of the largest cities of the New World, on a magnificent bay, backed by mountains. Railways are developing in the east.

The Guianas. The Guianas consist of tropical lowlands, densely forested, rising to the Guiana Highlands in the south. Sugar, cacao, coffee, and cotton are grown on the irrigated coastal plains. British Guiana is chiefly noted for sugar, and the name of Demerara sugar comes from the old name of the colony. Small quantities of gold, diamonds, and timber are produced also. The hot, moist climate, and the dense natural vegetation, however, make the development of this colony very difficult. The capital of British Guiana (120,000 sq. miles), or Demerara, is Georgetown. Paramaribo is the capital of Dutch Guiana (46,000 sq. miles), and Cayenne of French Guiana (30,000 sq. miles).

Venezuela. Venezuela (600,000 sq. miles) consists of three very different regions. The first is the eastern end of the Andes, where the valleys and slopes are cultivated with sugar, cotton, cacao, and other tropical products. This is the only settled part of the country. The capital is Caracas, lying in a fertile valley behind the coastal range, which is crossed by a railway to the port La Guayra. The second region is the lowlands of the Orinoco, a cattle country, as yet little developed. The third is the forested western slopes of the Guiana Highlands, little known, except round the gold-fields in the north.

INDEX

INDEX

Aar R., 149, 152.
Aberdeen, 87.
Abyssinia, 224–5.
Aconcagua Mt., 269.
Addis Halem, 225.
Adelaide, 241.
Aden, 196.
Adige R., 149, 158.
Adrianople, 166, 167.
Adriatic Sea, 158, 162.
Aegean Is., 166.
Aegean Sea, 162.
Afghanistan, 196.
Africa, 210–32.
Agra, 200.
Aire R., 47, 48, 51; Gap, 52.
Alaska, 247, 264.
Albania, 118, 162, 166.
Albert Edward Nyanza, L., 222, 225.
Albert Nyanza, L., 222, 225.
Alderney, 90.
Aleppo, 193.
Alexandria, 224.
Algiers, 221.
Alhambra, 158.
Allahabad, 200.
Allen, Bog, 35; L., 35, 36.
Aller R., 142.
Allier R., 128, 131.
Alps, 125, 127, 146–53.
Alsace, 125, 132, 133.
Altai Mts., 184.
Amazon R., 271–2.
America, Central, 266.
America, North, 245–66.
America, South, 267–82.
Amiens, 129.
Amsterdam, 124.
Amu Daria, 176, 179.
Amur, 187.
Andalusia, 156, 157.
Andes, 268–9.
Andorra, 118.
Angola, 228.
Antananarivo, 231.
Antigua, 267.
Antofagasta, 280.
Antrim Mts., 30, 31.
Antwerp, 129.
Aorangi Mt., 242.
Apennines Mts., 158.
Appalachian Mts., 249–50, 262.
Apulia, 158, 161.
Aquitaine, 132.
Arabia, 167, 174, 183, 196.
Aragon, 155.
Aral Sea, 176.
Archangel, 168.
Arctic Ocean, 96.
Ardennes Mts., 128, 129.
Argentina, 280.
Arizona, 261.
Armenia, 178, 179, 188, 192.
Arno R., 158, 159.
Ascension I., 232.
Asia, 174–210.
Asia Minor, 167, 181, 188, 192.
Assam, 198.
Assiut, 223.
Assuan, 223, 224.
Astrakhan, 171.
Asuncion, 280.
Atacama Desert, 280.
Atbara R., 223.
Athens, 166, 167.
Atlas Mts., 220.
Auckland, 244.
Augsburg, 141.
Australasia, 233–44.
Australia, 233–42.
Australian Alps, 234.
Austria, 118, 152, 153.
Austrian Gate, 150.
Auvergne, 131.
Avon R., 60, 62, 65.
Ayr, 81.
Azov, Sea of, 171.

Baghdad, 174.
Bahama Is., 267.
Bahia, 281.
Baikal, L., 184.
Baku, 191.
Balkan Mts., 162.
Balkan Peninsula, 118, 162–4.
Ballarat, 241.
Baltic Sea, 93, 99.
Baltic Heights, 134.
Baltimore, 264.
Bangkok, 202.
Bangor, 53.
Barbados, 267.
Barcelona, 157.
Barmen-Elberfeld, 141.
Barrow, 32, 43.
Barry, 55.
Basel, 149, 151.
Basra, 194.
Batavia, 204.
Bath, 65.
Batum, 191.
Bavaria, 140.
Bavarian Foreland, 141, 142.
Bedford, 70.
Beira, 229.
Beirut, 193.
Belfast, 31, 32.
Belgium, 118, 125, 128, 129.
Belgrad, 165, 167.
Benares, 200.
Bendigo, 241.
Bengal, Bay of, 175.
Benue R., 226.
Bergen, 122.
Berlin, 143.
Bern, 152.
Berwick, 79.
Bessarabia, 154.
Bida, 227.
Bilbao, 157.
Birkenhead, 47, 71.
Birmingham, 59, 60, 71.
Blackburn, 49.
Black Country, 60.
Black Forest, 139, 141.
Black Sea, 163, 166, 171.
Blackwater R., 39.
Blagovestchensk, 195.
Blantyre, 224.
Blue Mts., 234.
Bodmin Moor, 58.
Bogota, 279.
Bohemia, 142, 144, 145, 153, 154.
Böhmer Wald, 142, 143, 153.
Bokhara, 195.
Bolivia, 279.
Bologna, 159.
Bolton, 49.
Boma, 228.
Bombay, 201.
Bordeaux, 132.
Borneo, 175, 203, 204.
Bosnia, 164.
Bosporus, 163, 167.
Boston, U.S.A., 262.
Bothnia, G. of, 167.
Boulogne, 74, 130.
Boyne R., 33.
Brabant, 129.
Bradford, 47.
Brahmaputra R., 181.
Bratislava, 150.
Brazil, 281.
Brazilian Highlands, 269.
Bremen, 142.
Brenner Route, 151.
Breslau, 145.
Brest, 131.
Brindisi, 161.
Brisbane, 241.
Bristol, 61, 62, 65.
British Columbia, 257.
British Honduras, 266.
British Isles, 4–91; Position, 5; Relief and Coast-line, 5, 7; Seas, 7; Highlands and Uplands, 7, 9; Structure, 9, 10; Rivers, 11; Vegetation, 12; Animals, 13; Plant and Animal Products, 13–16; Climate, 17–23; Rainfall, 17, 19; Temperature, 19–21; Winds, 21, 22; Human Geography, 23–7; Divisions, 23; Language and Religion, 24; Population, 25, 26; Coal-fields, 25, 26; Ireland, 28–40; England and Wales, 41–76; Scotland, 76–90.
British South Africa, 229–31.
Brittany, 125, 131.
Brocken, Mt., 142.
Brunswick, 142.
Brussels, 129.
Budapest, 154.
Buenos Aires, 280.
Bukarest, 155.
Bulawayo, 229.
Bulgaria, 118, 162, 164, 166.
Burdekin R., 235.
Burgas, 166.
Burgundy, 132.
Burma, 183, 201–2.
Burton-on-Trent, 62.
Bury, 48.
Bushire, 194.

Cadiz, 157.
Cairo, 224.
Calabria, 161.
Calais, 130.
Calcutta, 201.
Caledonian Canal, 87.
California, 260.
Callao, 279.
Cambodia, 183.
Cambridge, 66, 71.
Campagna, 161.
Campos, 274, 281.
Canada, 257–60.
Canadian-Pacific Railway, 257.
Cantabrian Mts., 155, 157.
Canterbury, 75.
Canterbury Downs, 244.
Canton, 207.
Canyon, 249.
Cape Breton I., 260.
Cape Province, 230.
Cape Town, 230.
Cape Verde Is., 232.
Caracas, 282.
Cardiff, 55, 73.
Carinthia, 152.
Carlisle, 43, 44.
Carniola, 164.
Carpathians, 99, 113, 146, 150, 151, 153–5.
Cascade Mts., 247.
Caspian Sea, 94, 178.
Cassiquiare R., 269.
Castile, 155.
Catania, 161.
Cauca R., 272.
Caucasus, 113, 168.
Caucasus Mts., 178, 179, 191.
Cayenne, 281.
Celebes, 175, 203.

Central European Highlands, 98.
Cette, 132.
Cettinye, 166.
Cevennes Mts., 125.
Ceylon, 185, 262.
Chad, L., 226.
Châlons-sur-Marne, 130.
Champagne, 131.
Champlain L., 263.
Channel Is., 90.
Chatham, 69, 73.
Chekho-Slovakia, 118, 153, 154.
Chemnitz, 143.
Chemulpho, 207.
Chesapeake Bay, 250.
Chester, 49, 56, 71.
Cheviot Hills, 45, 76.
Chicago, 262.
Chile, 280.
Chiltern Hills, 66.
Chimborazo, 268.
China, 204–7.
Chinese Turkestan, 197.
Christchurch, 244.
Cincinnati, 262.
Clermont, 131.
Cleveland, 262.
Clyde R., 80–2.
Coblenz, 140.
Colchester, 67, 71.
Cologne, 141.
Colombia, 278.
Colombo, 202.
Colorado R., 248.
Columbia R., 248.
Como, L., 158.
Concepcion, 280.
Congo R., 228.
Congo State, 228.
Constance, L., 139, 149.
Constantine, 221.
Constantinople, 118, 162, 166, 167.
Constantsa, 155.
Coolgardie, 242.
Copenhagen, 122.
Corinth, Isthmus of, 162.
Cork, 33, 39.
Corsica, 162.
Cossacks, 168.
Costa Rica, 266.
Cotopaxi, 268.
Cotswold Hills, 59, 63.
Courland, 167, 169.
Coventry, 61.
Cracow, 146.
Crete, 166.
Crewe, 62, 70.
Crimea, 167, 172, 173.
Crinan Canal, 87.
Croatia, 164.
Croats, 164.
Cuba, 266.
Cumbre Pass, 269.
Cyprus, 194.

Dalmatia, 164.
Dalmatian Coast, 146.
Dalnyi, 204.
Damascus, 193.
Danube R., 114, 141, 146, 148, 150, 153, 154, 155.
Danzig, 118, 146.
Dardanelles, 162.
Dar-es-Salaam, 226.
Darling R., 235.
Darlington, 46.
Dartmoor, 58.
Darwin, 236.
Dawson City, 257.
Dean Forest, 56.
Deccan, 174, 184, 201.
Dee R., 49, 56.
Delaware R., 250.
Delhi, 200.
Demerara, 281.
Denmark, 118, 122.
Derg, L., 36.
Derwent R., 51.
Devonport, 57.
Dijon, 132.
Dinaric Alps, 146, 162.
Dnieper R., 172.
Dobruja, 154.
Dominica, 267.
Don R., 171.
Dordogne R., 125, 131, 132.
Dorset, Vale of, 65.
Douai, 129.
Doubs R., 132.
Douro R., 155, 156.
Dover, 74, 75.
Downs, North and South, 66, 74, 75.
Drakensberg Mts., 229.
Drave R., 150.
Dublin, 32, 33.
Dudley, 60.
Duisberg, 141.
Duluth, 262.
Dumfries, 80.
Dunbar, 77, 79.
Dunbarton, 57, 58.
Dundalk, 32, 35.
Dundee, 85.
Dunedin, 244.
Dunfermline, 83.
Dunkirk, 130.
Durance R., 132, 149.
Durban, 230.
Durham, 45, 52.
Düsseldorf, 141.
Dvina, N., R., 168; W., R., 169.
Dyea, 257.

East Indies, 175.
East London, 230.
Ebro R., 155.
Ecuador, 268, 279.
Eden R., 43.
Edinburgh, 79, 80, 82.
Egmont Mt., 242.
Egypt, 167, 223–4.
Elba, 162.
Elbe R., 142, 144, 154.
Elbruz Mt., 178.
Elburz Mts., 178.
Elgin, 87.
Ely, 65, 71.
England, Highlands of, 7, 9; England and Wales, 41–76; Natural Regions of, 41–2; Northern England, 43–52; Wales, 52–7; West Country, 57–9; Midlands, 59–62; Scarp Lands and Clay Vales, 62–76; Railways, 44, 48, 52, 54, 57, 61, 70–3; Islands, 90.
Enniskillen, 30.
Erie, L., 249, 258, 259.
Eritrea, 225.
Erne, L., 30, 35; R., 30.
Erzerum, 192.
Erz Gebirge, 142, 143, 153.
Essen, 141.
Esthonia, 118, 167, 169.
Etna, Mt., 161.
Euphrates R., 175.
Eurasia, 175.
Europe, 92–118.
Everest, Mt., 180.
Evesham, 62.
Exeter, 59.
Exmoor, 59.
Eyre, L., 235.

Faeroe Is., 123.
Falkland Is., 281.
Fez, 221.
Fichtel Gebirge, 143.
Fife, 83; Coal-field, 83.
Fiji Is., 244.
Finland, 118, 121, 168.
Finland, G. of, 168, 169.
Finns, 167.
Fitzroy R., 235.
Flanders, 129.
Flint, 53.
Florence, 159.
Florida, 264.
Formosa, 209.
Fort Augustus, 88.
Fort William (Scot.), 87, 88; (N. Am.), 258.
Forth R., 80, 81.
Forth-Clyde Coal-fields, 80; Lowland, 80.
France, 118, 125–33.
Franco-Belgian Coal-field, 129, 142, 143.
Franconian Jura, 141, 143.
Frankfurt-on-the-Main, 140.
Frankfurt-on-the-Oder, 146.
Fraser R., 248, 257.
Freetown, 227.
Freiberg, 143.
Freiburg, 139.
Fujiyama, Mt., 186, 208.
Fundy Bay, 260.

Galatz, 155.
Galicia, 113, 167.
Galway, 32, 33, 37.
Ganges R., 180, 197. 198, 200.
Garda, L., 158.
Garonne R., 125, 131, 132.
Geelong, 241.
Geneva, 152.
Geneva, L., 149.
Genoa, 159.
Georgetown, 281.
Georgia, 191.
Germany, 118, 133–46.
Ghats, 184.
Ghent, 129.
Giant's Causeway, 31.
Gibraltar, 158.
Glasgow, 80–2.
Glen More, 84, 87.
Gloucester, 56, 62, 73.
Godaveri R., 184.
Gold Mts., 257.
Göteborg, 122.
Grampian Mts., 86.
Granada, 157.
Graz, 153.
Great Basin, 248, 261.
Great Belt, 122.
Great Dividing Range, 233, 234, 235.
Great Lakes, 249, 258, 259.
Great Ouse, 66.
Great Russians, 167.
Great Salt Lake, 248.
Greece, 118, 164, 166, 167.
Greenland, 250.
Greenock, 82.
Grenada, 267.
Grimsby, 47, 51.
Guadaljara, 265.
Guadalquivir R., 156.
Guadiana R., 155, 156.
Guatemala, 266.
Guayaquil, 279.
Guernsey, 90.
Guiana Highlands, 269.
Guianas, The, 281.
Guinea Coast, 226.

Hague, The, 124.
Haidarabad, 201.
Haiti, 267.
Hakodate, 208.
Halifax, 47.
Halifax (N.S.), 260.
Halle, 143.
Hamburg, 144.
Hammerfest, 122.
Hampshire Basin, 75.
Hankow, 206.
Hanoi, 203.
Hanover, 142.
Hartlepool, 46.
Harz Mts., 142, 143.
Havana, 267.
Havel R., 143.
Havre, Le, 131.
Hawaii, 244.
Hebrides, 88, 89.
Heidelberg, 140.
Hekla, 123.
Helsingfors, 168.
Herat, 197.
Hereford, 55, 56.
Herzegovina, 164.
Hesse, 142.
Himalaya Mts., 178, 179–81.
Hindu Kush Mts., 178, 183.

Hindustan, 182.
Hispaniola, 267.
Hobart, 242.
Holland, 118, 123, 124.
Holyhead, 33, 39.
Honduras, 266.
Hongkong, 207.
Honshiu, 208.
Huddersfield, 47.
Hudson Bay, 245.
Hudson R., 250; Route, 263, 264.
Hue, 203.
Hull, 47, 49, 51, 61.
Humber, 51.
Hungarian Gate, 148.
Hungary, 118, 150, 154.
Huron, L., 249, 258, 259.
Hwang-Ho R., 181, 205.

Iberian Mts., 155.
Iceland, 123.
Iller R., 141.
Immingham, 51.
India, 198–201.
Indo-China, 174, 202–3.
Indus R., 180, 198, 201.
Inn R., 150.
Innsbruck, 153.
Inverness, 87.
Ionian Is., 162, 166.
Ipswich, 67.
Iran, 178, 181.
Irawadi R., 181, 202.
Ireland, 28–40.
Irkutsk, 195.
Iron Gate, 150.
Isar R., 142.
Isère R., 132, 149.
Ispahan, 194.
Italy, 118, 158–62.

Jaffa, 193.
Jamaica, 267.
Japan, 186, 208–9.
Java, 175, 203, 204.
Jersey, 90.
Jerusalem, 193.
Jibuti, 225.
Johannesburg, 230.
Juneau, 264.
Jura Mts., 125, 151, 152.
Jutland, 118, 122.

Kabul, 197.
Kalahari Desert, 230.
Kalgoorlie, 241.
Kama R., 171.
Kamchatka, 175, 186.
Kandy, 202.
Kano, 227.
Karachi, 201.
Karelians, 167.
Karlsruhe, 139.
Karroo, 230.
Kashgar, 197.
Kashmir, 198.
Kazan, 171.
Keighley, 47.
Kent, Vale of, 75.
Kenya Colony, 225.
Kenya Mt., 225.
Kerch, Strait of, 171.
Keswick, 43.
Khabarovsk, 195.
Khaibar Pass, 197, 201.
Kharkov, 172.
Khartum, 223, 224.
Kherson, 172.
Khingan Mts., 187.
Khiva, 195.
Khojent, 195.
Khokand, 195.
Kidderminster, 60, 62.
Kiel, 144.
Kiel Canal, 145.
Kiev, 172.
Kilimanjaro Mt., 225.
Kingston (Jam.), 267.
Kingstown, 33, 40, 41.
Kiushiu, 209.
Kobe, 208.
Kola Peninsula, 168.
Korea, 207.
Kosciusko Mt., 234.
Krasnoyarsk, 195.
Kristiania, 122.
Kronstadt, 168.
Kurdistan, 192.
Kurile Is., 175, 187.
Kurisches Haff, 169.
Kwen Lun Mts., 178.
Kyoto, 208.

Labrador, 249, 260.
Lachlan R., 235.
Ladoga, L., 168.
Lagos, 227, 228.
La Guayra, 282.
Lahn R., 140.
Lahore, 201.
Lake Peninsula, 259.
Lancaster 43, 44.
Langres Plateau, 125, 128, 131.
Languedoc, 125, 132.
La Paz, 281.
Lapland, Russian, 168.
La Plata, 280.
Latvia, 118, 167, 169.
Lebanon Mts., 193.
Lech R., 141.
Leeds, 47.
Leeward Is., 267.
Leicester, 62, 70.
Leipzig, 143.
Leith, 82, 83.
Lek R., 124.
Lena R., 177.
Leningrad, 168.
Leopoldville, 228.
Letts, 167.
Lhasa, 196.
Liechtenstein, 119.
Liége, 129.
Liffey R., 39.
Ligurian Coast, 159.
Lille, 129.
Lima, 279.
Limerick, 32, 36.
Limpopo R., 229.
Lincoln, 51, 52.
Lipari Is., 161.
Lisbon, 157.
Lithuania, 118, 167, 169.
Little Belt, 122.
Liverpool, 47, 61, 71.
Llanos, 271, 274, 279.
Lodz, 146.
Lofoden Is., 121.
Loire R., 125, 131.
Lokoja, 227.
Lombardy, 158, 159.
Lomond, L., 82, 87.
London, 61, 67, 69, 70; Railways entering, 70, 71, 73.
Londonderry, 30.
Lorraine, 128.
Lourenço Marques, 230.
Lower Danubian Plain, 154.
Lowestoft, 67.
Lübeck, 144.
Lu Chu Is., 175, 186.
Lucknow, 200.
Luxemburg, 141.
Luzon, 204.
Lyon, 132.
Lys R., 129.

Macedonia, 166.
Mackenzie R., 249.
Madagascar, 231.
Madeira, 232; R., 272.
Madras, 201.
Madrid, 157.
Magdalena R., 272.
Magdeburg, 143.
Magellan, Strait of, 267.
Maggiore, L., 149, 158.
Maidstone, 75.
Main R., 140.
Mainz, 140.
Malaga, 157.
Malar, L., 121.
Malay Archipelago, 203; Peninsula, 203.
Malta, 162.
Man, Isle of, 90.
Manaos, 281.
Manchester, 47.
Manchuria, 187, 204.
Mandalay, 202.
Manila, 204.
Manitoba, 258.
Mannheim, 140.
Marañon R., 271.
Maritsa R., 162, 164, 166, 167.
Marmora, Sea of, 162.
Marne R., 131.
Marseilles, 132.
Mecca, 196.
Medina, 196.
Mediterranean Sea, 93, 96.
Mekong R., 181, 182.
Melbourne, 241.
Memel, 169.
Menam R., 182.
Mendip Hills, 59.
Mendoza, 281.
Mersey R., 49, 50, 51, 71.
Merthyr Tydfil, 55.
Merv, 195.
Meseta, 155, 157.
Mesopotamia, 167, 179, 180, 188, 193.
Messina, Straits of, 161.
Mettis, 130.
Metz, 137.
Meuse R., 124, 125, 129, 130.
Mexico, 264–6; City, 265.
Michigan, L., 249, 258, 259.
Middle Danubian Plain, 150, 154.
Middlesbrough, 46.
Midlands, 59; Coal-fields of, 60–2.
Milan, 159.
Minsk, 172.
Missouri-Mississippi R., 249, 261–2.
Mitava, 169.
Mobile, 262.
Mohawk Valley, 264.
Mokha, 196.
Moldavia, 154.
Molucca Is., 175, 203–4.
Mombasa, 226.
Monaco, 118, 132.
Mongolia, 187, 197.
Mont Blanc, 148.
Mont Cenis, 151.
Mont Dore, 127.
Montenegro, 166.
Monte Rosa, 148.
Monte Video, 280.
Montreal, 258, 259.
Morava R., 162, 164, 165, 167.
Moravia, 145, 153.
Moravian Highlands, 142.
Morea, 162.
Morocco, 221.
Moscow, 168, 169, 171.
Moselle R., 130, 140.
Mostar, 166.
Mosul, 194.
Moulmein, 202.
Moville, 30.
Mühlhausen, 135.
Mukden, 195, 204.
Mulde R., 143.
Mulhouse, 133.
Multan, 201.
Munich, 142.
Murcia, 157.
Murmansk Coast, 168.
Murray R., 235.
Murrumbidgee, 235.
Muscat, 196.

Nagasaki, 209.
Nancy, 129, 130.
Nantes, 131.
Naples, 161.
Narbada R., 184.
Narvik, 121.
Natal, 230.
Neagh, L., 30, 31.
Neckar R., 139.
Negro R., 272.
Nelson R., 249.
Neuchâtel, L., 149.
Neva R., 168.
Nevis, Ben, 86.
New Brunswick, 260.
Newcastle-on-Tyne, 44, 45.

New England, 262.
Newfoundland, 260.
New Guinea, 233.
New Mexico, 261.
New Orleans, 262.
Newport, 55.
New South Wales, 240.
New York, 264.
New Zealand, 242.
Niagara Falls, 259.
Nicaragua, 266.
Nice, 132.
Niemen R., 169.
Niger R., 226–8.
Nigeria, 227.
Nile R., 222–5.
Nilgiri Hills, 184.
Nish, 167.
Niuchwang, 205.
Nizhni Novgorod, 171.
Normandy, 125, 128, 131.
Northampton Heights, 59, 63.
North Sea, 93.
North-West Highlands of Europe, 98.
Norway, 118, 119–22.
Nottingham, 47.
Nova Scotia, 260.
Novocherkask, 171.
Nürnberg, 140.
Nyasa, L., 225.

Ob R., 176.
Oder R., 144, 145, 154.
Odessa, 172.
Ohio R., 261.
Oka R., 169.
Okhotsk, Sea of, 175.
Omaha, 262.
Omsk, 195.
Onega, L., 168.
Ontario, L., 249, 258, 259.
Oporto, 157.
Oran, 221.
Orange R., 229.
Orange Free State, 230.
Orenburg, 196.
Orinoco R., 269–71.
Orkney Is., 88.
Orléans, 131.
Osaka, 208.
Ostend, 74, 129.
Ottawa, 258.
Ouse R., 52, 66.
Oxford, 65, 73.

Pacific, Islands of, 244.
Paisley, 82.
Palermo, 161.
Palestine, 167, 188, 193.
Pamirs, 178.
Pampas, 272.
Panama, 266.
Para, 281.
Paraguay, 280.
Paramaribo, 281.
Parana-Paraguay, 272.
Paris, 131.
Pasco, 279.
Peak District, 45.
Pechora R., 168.
Peebles, 79.
Peking, 206.
Pemba, 226.
Pennine Coal-field, 45.
Pennine Mts., 44. 60.
Pentland Firth, 88.
Pentland Hills, 82.
Perm, 171.
Pernambuco, 281.
Persia, 194.
Perth, 80, 84; (Aus.), 242.
Peru, 279.
Peshawar, 201.
Peterborough, 65, 71.
Peterhead, 87.
Petrograd, 168.
Philadelphia, 264.
Philippine Is., 175, 187, 203.
Philippopolis, 166.
Pietermaritzburg, 230.
Pittsburg, 262.
Plate R., 272.
Ploeshti, 155.
Plymouth, 57.
Plynlymmon, Mt., 60.
Po R., 158.
Poland, 118, 146.
Pontic Mts., 178.
Poona, 201.
Popocatapetl, Mt., 249, 265.
Port Arthur, 195, 205.
Port Elizabeth, 230.
Portland (Or.), 260.
Porto Rico, 267.
Portsmouth, 73, 75.
Portugal, 118, 155–8.
Potomac R., 250.
Potteries, 49.
Prag, 154.
Prairies, 254.
Preston, 49, 52.
Pretoria, 230.
Prince Edward I., 260.
Provence, 132.
Pueblo, 265.
Pyrenees, 125, 127, 155.

Quebec, 260.
Queensland, 239–40.
Queenstown, 39.
Quito, 279.

Rajputana, 199.
Rand, 230.
Rangoon, 202.
Ratisbon, 142.
Reading, 70, 73.
Red R., 258.
Red Sea, 174.
Ree, L., 33, 35.
Reims, 129, 130, 131.
Reno R., 159.
Resht, 194.
Reunion, 231.
Reuss R., 149.
Reval, 169.
Reykjavik, 123.
Rhine R., 124, 139–41, 149.
Rhodesia, 229.
Rhodope Mts., 162.
Rhone R., 100, 101, 125, 128, 132, 148, 149.
Rias Coast, 38.
Riesen Gebirge, 142, 145.
Riga, 169.
Rio Janeiro, 281.
Riviera, 132.
Rochdale, 47.
Rockhampton, 241.
Rocky Mts., 247–9.
Rome, 161.
Rosario, 280.
Rostov, 171.
Rotterdam, 124.
Roubaix, 129.
Rouen, 131.
Ruapehu Mt., 242. [141.
Ruhr R., 141; country,
Rumania, 113, 118, 154, 155.
Russia, 118, 119, 167–73.
Russian Plain, 97, 98.
Rustchuk, 166.
Ruthenians, 167.
Ruwenzori, Mt., 226.

Saale R., 143.
Saar Basin, 128.
Saar R., 140.
Sacramento R., 261.
Sahara, 221–2.
Saigon, 203.
St. Andrews, 83.
St. Etienne, 128. 131.
St. Gothard, 148, 151.
St. Helena, 232.
St. Helens, 48.
St. John, 260.
St. John's, 260.
St. Lawrence, 249.
St. Lucia, 267.
St. Nazaire, 131.
St. Quentin, 129.
St. Vincent, 267.
Salford, 49.
Salisbury, 76, (Rhod.), 229.
Salonica, 166, 167.
Salt Lake City, 261.
Salvador, 266.
Salwen R., 181, 202.
Salzburg, 152.
Salzburg (town), 153.
Samara, 171.
Samarkand, 195.
Sambre-Meuse Basin, 128, 129.
Samoa, 244.
San Domingo, 267.
San Francisco, 261, 272.
San Marino, 119.
San Paul de Loanda, 228.
San Salvador, 281.
Santander, 157.
Santiago, 280.
Santos, 281.
Sao Paulo, 281.
Saône R., 100, 101, 125, 132, 149.
Saratov, 171.
Sardinia, 162.
Saskatchewan R., 258.
Save R., 150.
Saxon Coal-field, 138, 143, 144.
Saxony, 143, 144.
Scheldt R., 125, 129.
Scilly Is., 59.
Scotland, 76–90.
Seine R., 125, 130, 131.
Selkirk Mts., 257.
Selvas, 275.
Seoul, 207.
Serbia, 164, 165.
Serbs, 164.
Severn R., 56, 59, 60, 62; Tunnel, 57, 73.
Seville, 157.
Shanghai, 206.
Shannon R., 35, 36.
Sheffield, 47.
Shetland Is., 88.
Shields, North and South, 46.
Shikoku, 209.
Shiraz, 194.
Shire R., 229.
Shotts, 221.
Shrewsbury, 56, 62, 71.
Siam, 183, 202.
Siberia, 194.
Siberian Lowland, 176–7.
Siberian Railway, 195.
Sicily, 161, 162.
Sierra Leone, 227.
Sierra Morena, 156.
Sierra Nevada, 156.
Si-kiang R., 206.
Silesia, 138, 145, 153.
Simferopol, 172.
Simplon route, 151.
Singapore, 203.
Sitka, 264.
Skagway, 257.
Skye, 89.
Slavonia, 164.
Sligo, 32, 33, 37.
Slovakia, 153.
Slovenes, 164.
Smyrna, 192.
Snowdon, 53.
Sofia, 166, 167.
Solent, 75.
Somaliland, 225.
Somerset, 59.
Soo, 259.
Sorata Mt., 269.
Sound, 122.
Southampton, 75.
Spain, 118, 155–8.
Spires, 140.
Spithead, 75.
Spitsbergen, 121.
Spree R., 143.
Staffordshire Coal-field, 49.
Stanovoi Mts., 177.
Steppe, 108, 109, 194, 254.
Stettin, 144, 146.
Stirling, 80, 83.
Stockholm, 122.
Stockton-on-Tees, 45.
Strasbourg, 133, 141.
Strathmore, 84.
Stretensk, 195.
Stroud, 65.
Stuttgart, 130.
Styria, 152.

Sudan, 222, 226, 227.
Sudetes Mts., 142, 143, 153.
Suez, 42, 183; Canal, 124.
Sulaiman Mts., 178, 183.
Sumatra, 175, 203.
Sunda Is., 175, 203.
Sunderland, 45.
Superior, L., 249, 258, 259.
Susquehanna R., 250.
Sutlej R., 198.
Swabian Jura, 141, 143.
Swansea, 55, 75.
Sweden, 118, 119–22.
Swiss Jura, 139, 143, 149.
Switzerland, 118, 148, 151, 152.
Syr Daria R., 176, 179.
Syria, 167, 188, 192, 193.

Tabriz, 194.
Tafilet, 221.
Tagus R., 155, 156, 157.
Taiga, 177.
Tamatave, 231.
Tampico, 266.
Tanganyika Territory, 225, 226.
Taranto, 161.
Tarim R., 178, 197.
Tarn R., 132.
Tashkent, 195.
Tasmania, 233, 242.
Tatar-Bashkir Country, 171.
Tatars, 167, 168.
Taunton, 59.
Taurida, 167, 172.
Taurus Mts., 178.
Tay, L., 53; R., 80.
Techuantepec, 264.
Tees R., 46.
Teheran, 194.
Tell, 221.
Teneriffe, 232.
Terai, 198.
Thames R., 65, 67, 69.
Thüringer Wald, 143.
Tian Shan Mts., 178, 179.
Tiber R., 158, 161.
Tibet, 178, 181, 196.
Ticino R., 149.
Tientsin, 206.
Tierra del Fuego, 267.
Tiflis, 191.
Tigris R., 179, 194.
Timbuktu, 227, 228.
Tirol, 152.
Tisza R., 151, 154.
Titicaca, L., 269, 279.
Tocantins R., 272.
Tokay, 154.
Tokyo, 208.
Tomsk, 195.
Tongariro, 242.
Toronto, 259.
Toulon, 132.
Toulouse, 132.
Touraine, 131.
Tourcoing, 129.
Transcaspian Railway, 195.
Transvaal, 230.
Transylvanian Alps, 154, 155.
Trebizond, 192.
Trent R., 50, 51, 52, 59.
Trentino, 158.
Trieste, 153, 159.
Trinidad, 267.
Tripoli, 222.
Trondhjem, 122.
Tucuman, 280.
Tula, 169.
Tunis, 221.
Turan, 175–6.
Turin, 159.
Turkey, 118, 166.
Tuscany, 158, 159.
Tweed R., 76, 79.
Tyne R., 46.

Uganda, 226.
Ukrainia, 172.
Ukrainians, 167.
Ulm, 141.
Umbria, 159.
United States, 260–4.
Upsala, 122.
Ural Mts., 168, 171.
Uruguay R., 272.
Utrecht, 124.

Vaal R., 229.
Valdai Hills, 169.
Valencia, 157.
Valencia (town), 157.
Valparaiso, 280.
Vancouver, 257.
Vardar R., 162, 165, 166, 167.
Varna, 166.
Vener, L., 122.
Venezuela, 282.
Venice, 159.
Vera Cruz, 265, 266.
Verkhoyansk Mts., 177.
Verona, 159.
Vesuvius, 161.
Vetter, L., 122.
Victoria (Am.), 257; (Aus.), 241.
Victoria Falls, 229.
Victoria Nyanza, L., 222, 226.
Vienna, 150, 152, 153.
Vilna, 169.
Vistula R., 146, 154.
Vladivostok, 195.
Volga R., 169, 171.
Vosges Mts., 125, 139.

Waal R., 124.
Wales, 52–7.
Wallachia, 150.
Walsall, 60.
Warsaw, 146.
Wash, 51, 66.
Washington, 264.
Wastwater, L., 43.
Waterford, 39.
Weald, 74.
Wednesbury, 60.
Welle R., 228.
Wellington, 244.
Weser R., 142.
West Indies, 266–7.
Westphalia, 138.
Westphalian Gorge, 142.
Wexford, 33, 39.
White Russians, 167, 172.
Wick, 88.
Wicklow, 41.
Wight, Isle of, 75.
Winchester, 76.
Windward Is., 267.
Winnipeg, 258.
Wolverhampton, 60.
Worcester, 56, 62, 73.
Worms, 140.
Wye R., 55.

Yablonoi Mts., 187.
Yangtse-kiang R., 181, 206.
Yarkand, 197.
Yarmouth, 67, 71.
Yellowstone Park, 261.
Yenisei R., 177.
Yezo, 208.
Yokohama, 208.
York, 52.
Yorkshire Coal-field, 47.
Yorkshire Ouse R., 51.
Yosemite Valley, 261.
Yugo-Slavia, 118, 162 164, 165.
Yukon R., 247, 257 264.

Zagros Mts., 178.
Zambezi R., 228–9.
Zanzibar, 226.
Zaragoza, 157.
Zaria, 228.
Zeebrugge, 129.
Zungeru, 227.
Zürich, 151, 152.
Zuyder Zee, 123.

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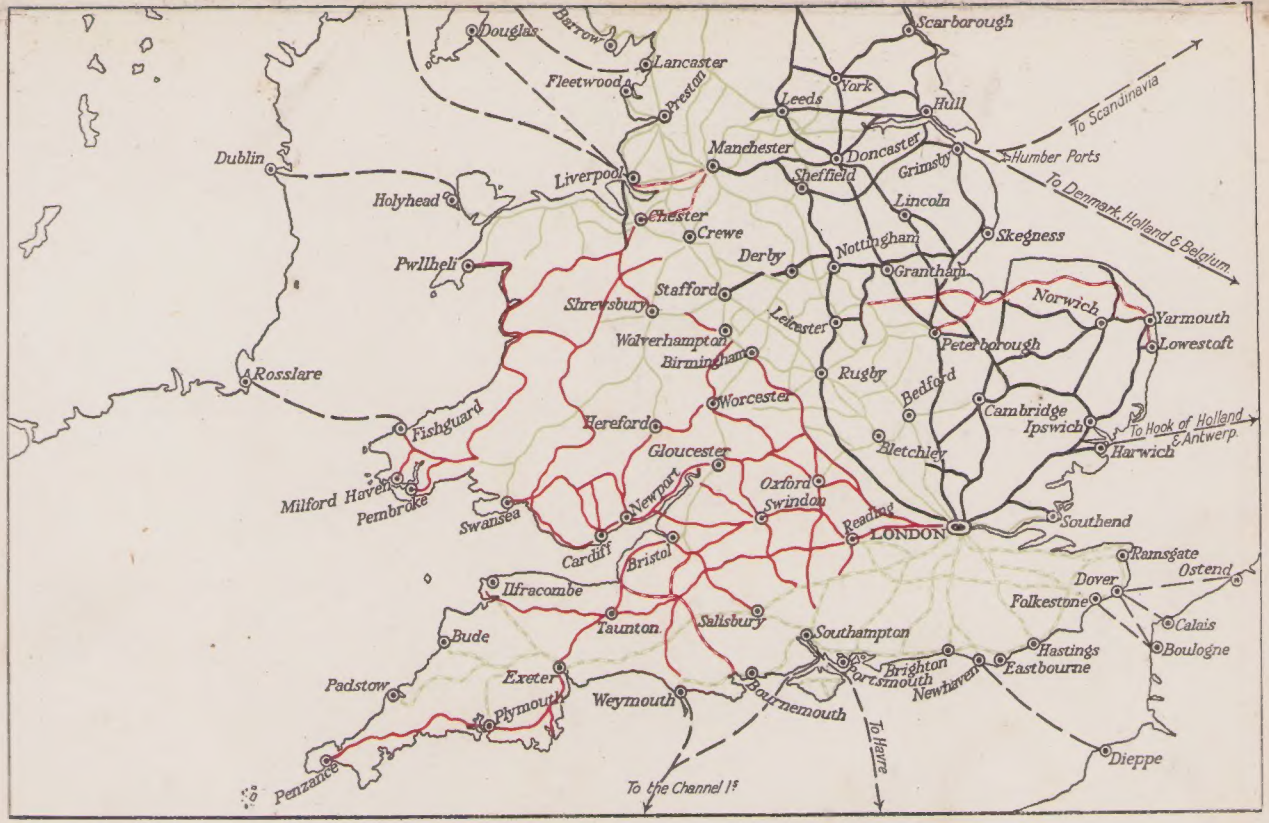
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